WONDERS OF TRANSPORT

THE STAR OF INDIA SERIES

BLACKIE AND SON LIMITED

WONDERS OF TRANSPORT

EPISODES IN THE HISTORY OF TRANSPORT

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NOTE

This book is essentially an edition of Mr. Cyril Hall's *Wonders of Transport* specially adjusted for its present form of issue.

CONTENTS

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CHAPTER I

Introductory

Have you ever considered the subject of commerce in its practical bearings upon your own daily life? Have you ever tried to form an idea of the organization which has been created to supply your particular wants? If so, you could hardly fail to realize the fact that the greatest industrial undertaking in the world—the industry upon which all other industries depend—is the carrying trade, the trade which brings to the craftsman and the manufacturer the raw materials for their work, and delivers the finished product into the hand of the individual who happens to want it. Every hour of the day and night, steamships are furrowing the ocean; trains are rushing along the railway; men and women, horses, oxen, mules, camels, elephants, and even dogs are toiling in one part of the globe or another to anticipate your needs. In your pocket, if you are lucky, is Aladdin's lamp. In this unromantic age it is called currency; but it is the same thing, with the difference that nowadays it can accomplish marvels of which Aladdin never

dreamt. Place the magic lamp on the counter of the city store or village shop, and what wonders will it not perform! Would you like an apple from British Columbia, a banana from the West Indies, or chocolate from Brazil? You have but to name it, and hey, presto! the apple, the banana, or the chocolate is in your hand. For a small piece of copper the modern Genie of the Lamp will take a letter from you to the Antipodes, or will carry you bodily for a mile with greater speed and comfort than the Sultan Haroun al-Raschid ever travelled with in his life. Nor are the powers of the Genie limited to the surface of earth or ocean. Say the word, and he will bring you with equal ease a graphite pencil from the mines of Cumberland, or a sponge from the depths of tropic seas.

The name of the Genie is Transport. In the following pages we will try to trace his growth from a puny child, wandering in the trail of a savage tribe, to the colossal giant who now bestrides two hemispheres and distributes the world's products in a ceaseless shower.

A chapter on Transport in the Earliest Age of Man would be brief. It must have been thousands of years after man first walked the earth when he learnt to carry things from one place to another with any more intelligent idea of turning them to account than is shown by a dog in running off with a bone, or a bird in gathering materials for its nest. Even when necessity taught him to make weapons for self-defence and for obtaining food, and to collect things such as skins and shells for his comfort and decoration—in other words, when he began to acquire portable property—he could keep no more than he could carry and defend with his own strong arm. By and by he discovered the disadvantage of a condition of affairs in which every man was a law unto himself, and he combined with his fellow-savages to enforce a certain amount of respect for ownership. Tribal customs and regulations grew up which provided more or less security for property,

and negotiations began to supersede robbery as the rule of exchange. Men began to accumulate goods—rude weapons for fighting, hunting, and fishing, skins for covering themselves in cold weather, shells for use as drinking-vessels, and charms warranted to defeat the designs of evil spirits. Then bartering became a business wherever there was anybody to barter with; and then, as men wandered from one hunting-ground to another, the question of transport first began to exercise their ingenuity.

For ages porterage must have been the chief means of transport employed; and this not so much on account of the difficulty of capturing and taming wild animals, as because the trackless world in which our remotest ancestors lived was for the most part unadapted for quadrupedal traffic. Porterage is still the principal means of carriage in certain countries of the globe—for example, in the jungles of Darkest Africa and the mountainous districts of Northern India; and men and women, trained to the task, can carry burdens of surprising weight upon their heads or backs for a long day's march.

At what period in the world's history four-footed animals were first enslaved by man, or what was the first animal so tamed, we have no means of ascertaining. Archæologists divide the traces of men and animals which have been found in caves into three periods, but opinions differ widely as to the ages of these periods as measured by years. In the first, or Pleistocene period, we find the remains of man in company with those of the mammoth, the sloth, and the woolly rhinoceros, as well as of other animals, such as the horse, lion, wolf, fox, bison, stag, and hyena, whose representatives are still with us. The cave-dweller of the Pleistocene period was akin to the modern Eskimo. He had discovered how to make a fire; probably he cooked his food. He made rude implements of flint and bone; he covered himself with skins sewn together with sinews or strips of intestines; and he spent some of his idle hours in engraving,

upon horn and ivory, representations of the animals with which he was familiar. But those ancient artists possessed no domestic animals. The second period of man's development is called the Prehistoric, and comprises what are called the Neolithic, Bronze, and Iron stages of civilization. It is in the relics of this period, which immediately precedes the Historic, that evidences of the domestication of animals are first found. The bones of the dog and the ox are among them; and it is reasonable to suppose that these two animals, originally kept for food, were the first to be commonly employed for transport. The wheel had not yet been invented, but a sledge of some sort would be well within the mechanical capacities of Prehistoric Man. Probably he made a sledge before he had a tame dog or ox to draw it; but, given the possession of so useful a servant, the bright idea of putting it into harness would very soon occur to him.

CHAPTER II

Animal Transport

The domestic dog of to-day is probably the product of the crossing of several species of wild animals, living and extinct. As a transport animal he is not now of much account except in Polar regions, but there he is all-important both to the native dweller and to the explorer.

The Eskimo dog is usually of a black-and-white colour, nearly as large as a mastiff, with a bushy tail and a black pointed muzzle. He is sometimes employed as a beast of burden, carrying loads on his back, but more often in drawing sledges over the snow. Kane, the Arctic traveller, relates that six dogs carried him, with a well-loaded sledge, for a fortnight at an average rate of nearly 60 miles a day. Such useful servants deserve good treatment; but " I never heard ", says Kane, " a kind accent from the Eskimo to his dog. The driver's whip of walrus hide, some 20 feet long, or a stone or a lump of ice skilfully directed, an imprecation loud and sharp made emphatic by the fist or foot, and a grudged ration of seals' meat, make up the winter's entertainment of an Eskimo team." " Neither the dog nor his master ", says Captain Parry in his *Journal*, " is half civilized or subdued "; and it is scarcely to be wondered at that the poor beasts are irritable and difficult to manage. A trustworthy and experienced dog is chosen as leader of the sledging team, and, as there are no reins, is guided solely by the driver's voice and the crack of his whip. The actual

stroke of the whip is used, when driving, as little as possible; not, I am afraid, from any motive of kindness to animals, but because, if a dog feels the lash, he is as likely as not to turn round and attack the dog behind him, throwing the whole team into confusion and perhaps upsetting the sledge.

Except on snow-covered ground the dog is unfitted for



Laplander's Travelling Sledge

draught purposes by reason of the softness of his paws. Nevertheless, before the existence of societies for the prevention of cruelty, the dog in harness was once a common object in the streets of English towns. In some Continental countries dogs may still be seen drawing small carts laden with vegetables, laundry linen, or dairy produce; and in Newfoundland the famous dog which takes its name from that island is used by the peasantry for drawing fuel from the forest.

An animal which like the dog is of great service as a

carrier in snow-clad countries is the reindeer, which has long been domesticated in Scandinavia, and which is to the Laplanders what the horse, sheep, ox, and goat are to the dwellers in milder climes. A humane law forbids the Lap to put a heavier load than 130 pounds upon the reindeer's back, or to make it draw more than 190 pounds upon a sledge, but these weights it can carry or draw for ten or twelve hours at a time, at the rate of about 10 miles an hour. The worst enemy of the reindeer is a sort of gadfly which lays its eggs in his hide and torments the poor animal cruelly. This persecution is partly the cause of the reindeer's habit of leaving the lowlands every year. It would be odd if all the cows or the sheep in England, when summer came, kicked up their heels and trotted off to the seaside for a change of air; but that is what the Laplander's cattle do, and the Laplander and his family have to go with them.

The animal which perhaps contributed more than any other to the growth of early civilization was the ox. We have evidence of the use of oxen for transport from the earliest historic times. In the monuments of ancient Assyria and Egypt there are many sculptured representations of oxen drawing carts laden with captives or produce. In many countries oxen are still used for transport. In some parts of India, of Southern Europe, and of South America the slowly-moving cart drawn by a pair of oxen is one of the most familiar objects of the highway; while in South Africa the bullock wagon, drawn by a team of perhaps a dozen horned beasts, is the ordinary means of transporting heavy goods in districts which the railways have not yet reached.

Of next importance to the ox as a bearer of man's burdens in the early days of civilization we must surely place the ass. The origin of the ass, like that of the dog, is lost in the mists of time. It is true that wild asses are to be found in various lands, but there is reason to believe that these

are the descendants of domesticated animals which have escaped from captivity. Two peculiarities of the patient and surefooted *Asinus vulgaris* seem to indicate that his forefathers belonged to the deserts of Asia or Africa: one is the surprise and distrust which he evinces, in common with the camel, in finding a stream of water in his path; the other is the delight he takes in rolling in the dust. The Hebrews used him as a beast of burden, for ploughing, and for riding, and held him in high esteem, although as food he was unclean because he did not chew the cud. The Greeks, the Romans, the Egyptians, and other nations laughed at his supposed stupidity, but made free use of his services nevertheless.

The bad name has stuck to the poor donkey, but he is really one of the cleverest of domesticated animals. It is said that in Spain as much as £200 is sometimes paid for an ass. The Arabs and Persians, too, give this animal the attention it deserves, and by careful breeding have greatly improved its appearance and usefulness. In view of the antiquity of the ass, it is rather surprising to find that, although there is evidence of its presence in Britain in the Saxon period, it was not common in these islands until after the time of Queen Elizabeth.

Even more valuable than the ass as an aid to transport is his half-brother the mule—the offspring of a male ass and a female horse. Its first breeders are said to have been the inhabitants of Mysia, an ancient province of Asia Minor—a people famous as mountain hunters. Homer tells us that the Mysians gave Priam the mules which drew his chariot; and when Nausicaa took her garments to the seashore to be washed, the wagon which carried them was drawn by mules.

The Greeks and Romans used the mule both as a pack and as a draught animal. In modern times it is to be seen at work in almost every part of the world, and in some countries it is the principal means of transport. Twenty

or thirty years ago, before tram-cars were driven by mechanical power, mules were often used upon the tramways of London and other English towns; and to this day the British Government is probably the largest employer of mules in the world. Since the Peninsular War these hardy beasts have shared the burdens and the risks of the British soldier. Mules form part of the permanent transport of the Indian Army, and their breeding is encouraged by the Government.

Mules are bred extensively in the south of France, Spain, Portugal, and Italy, and are largely used as pack and draught animals. In Spain and Italy they are often used for private carriages, and a well-matched pair of carriage mules frequently commands a higher price than a pair of horses. The mules of Poitou are famous, and are exported to all parts of the world. The mules of Asia Minor, Syria, Cyprus, Egypt, and Algeria are also good workers, and more than ten thousand of them were enlisted in our campaign against the cruel King Theodore of Abyssinia. In the New World mules are bred in both North and South America, the Kentucky and the Mexican mules being perhaps the best.

In countries where roads are bad, the mule is preferred to any other animal as a means of transport. " It possesses ", says Professor Fleming, " the sobriety, patience, endurance, and surefootedness of the ass, and the vigour, strength, and courage of the horse. As a beast of burden it is preferable to the horse, being less impatient under the pressure of heavy weights, while the skin being harder and less sensitive renders it more capable of resisting sun and rain. It is very frugal, easily fed, and equally good for carrying as for drawing loads; it walks well and steadily, easily traverses the worst roads or paths, will climb or descend a steep mountain or pick its steps by the side of a precipice, with the surety and safety of a goat. For hot and dry countries, especially those which are mountainous,

it is well adapted, though cold and wet regions are not suitable for it."

Curiously enough, the laden mule goes faster up hill than down, but like all animals, man not excepted, he suffers badly from the rarity of the air at high altitudes. Mr. Whymper, in his famous exploration of the Andes, found that his mules began to show signs of distress after reaching a height of 16,000 feet. The male mule is sturdier than the female, but is apt to give more trouble to his drivers. Like the famous little girl, the mule when he is good is very, very good, but when he is bad he is horrid. He sleeps for only three or four hours out of the twenty-four. Perhaps that may account for the shortness of his temper.

The horse was probably almost if not quite the last of domesticated animals to be utilized for the carriage of material as distinct from persons. This fact may seem the more remarkable when we consider that the horse was one of the first animals to be tamed by man, and that it existed in remote ages in nearly every part of the world. The horse's teeth, says Colonel Hamilton Smith, " lie in the Polar ice along with the bones of the Siberian mammoth; in the Himalaya mountains; in the caverns of Ireland, and in Barbary ".

Both anatomically and historically the horse is the most interesting of all domesticated animals. If an unlearned person were told that there is in existence a quadruped, a cousin of the rhinoceros and the tapir, which gallops about on the tips of its toe-nails, he would probably find himself picturing in his mind an animal closely akin to the species nightmare. Yet the description applies with perfect accuracy to the graceful and familiar horse. What we call the horse's knee is no knee at all, but a wrist or ankle; its " foot " corresponds with your middle finger or toe, its hoof is a toe-nail. In the geological deposits of distant ages, we find the ancestors of the horse, at this period a quaint little creature, no bigger than a fox, with five toes

on each foot. As the ages rolled by he increased in size, and for some reason or other he gradually dispensed with all his toes except one on each foot, that one becoming longer and broader and stronger and the nail thickening and changing its shape, so that by the time man was ready to make use of him he had assumed very nearly the form which you know so well.

In some parts of the world, such as Tartary and the American prairies, the horse runs wild to-day in conditions which must be very similar to those which existed when he was first enslaved by our primitive ancestors. The wild horses congregate in vast herds, the whole herd acting with instant obedience to the direction of a single leader, who seems to be able in some wonderful manner to convey his orders to all his subjects simultaneously. The Tartars hunt these wild horses with falcons trained for the purpose. The bird, liberated at the critical moment of the chase, alights on a horse's head, and fluttering its wings in his face, so blinds and frightens him that he is unable to escape with his companions, but stands trembling and bewildered until the hunter comes up to secure him.

The wild horse or mustang of the American prairies, the descendant of the horses of Spanish invaders, is generally captured with the lasso—a carefully-plaited rope of green hide, one end of which is fastened to the saddle, the other end being attached to an iron ring. When not in use the lasso hangs in a coil upon the saddle, but on approaching a horse the rider throws the coil over his left arm and makes a noose, 4 or 5 feet long, by slipping the end of the cord through the ring. Then grasping with his right hand the end of the noose that is farthest from the ring, he swings it round his head and lets it fly at his quarry with an impetus which carries it to the full limit of the cord. In practised hands the lasso can be thrown with precision to a distance of 30 feet. When the mustang finds it round his neck he is naturally much annoyed; but the more he plunges and

struggles the more uncomfortable his new collar feels, until at last he discovers that unless he stands still he will run a considerable risk of being strangled. Then the hunter dismounts and, keeping a firm hold of the lasso, approaches the nearly exhausted captive. Hand over hand he works his way towards the poor animal, until at last he is able to seize its head and to blow strongly into its nostrils. This last performance so greatly astonishes the horse that it resigns itself, without further opposition, to the loss of its liberty.

In early times the horse was valued, as is still the case among the Tartars, almost as much for its flesh and its milk as for its qualities as a riding or driving animal. In this capacity it seems to have been used only in hunting and in war. Warriors mounted on horseback are depicted on the ancient monuments of Babylonia and Assyria, but the more customary mode of fighting was from chariots drawn by two and later by four horses harnessed abreast. Assyrian monuments even show chariots employed in lion-hunting. The Greek heroes before Troy, you will remember, always fought from chariots and never from horseback. Saddles were not used until a comparatively late period; only one is represented on the ancient Assyrian sculptures.

In Holy Writ, chariot horses and riding horses are frequently mentioned as used by the Israelites after the time of David, and Solomon established a regular trade in horses from Egypt. Cæsar says that the ancient Britons had war chariots which they handled with considerable skill. Their horses were probably small but sturdy animals. The Romans, and after them the Normans, brought in horses from many countries, but the English horse was many centuries in attaining the pre-eminence which it now enjoys upon the road, the race-course, and the hunting-field. "Foreign breeds were greatly preferred. Spanish jennets were regarded as the finest chargers, and were imported

for purposes of pageantry and war. The coaches of the aristocracy were drawn by grey Flemish mares, which trotted, as it was thought, with a peculiar grace, and endured better than any cattle reared in our island the work of dragging a ponderous equipage over the rugged pavement of London. Neither the modern dray horse nor the modern race-horse was then known."

Compared with the horse, the camel is one of the ugliest and clumsiest creatures that walks the earth; and yet it is surely one of the most wonderful. The hideous nostrils, which can be opened or closed at will, protect organs with an extraordinarily keen sense of smell from contact with the hot sand. The broad, clumsy-looking pad on which the camel's foot rests is the most perfect sand-shoe imaginable. The ungainly hump is in reality a store of food—a reserve of fat which can be drawn upon by the rest of the body when other supplies fail; and the great paunch contains a reservoir which enables the camel to travel from three to five days in the hottest sun without a drink. Occasionally, so travellers tell us, the Arab will sacrifice his camel for the sake of the water contained in its paunch. When other animals are starving, the camel thrives, says Sir Samuel Baker, " on the ends of barren leafless twigs, the dried sticks of certain shrubs, and the tough dry paper-like substance of the dome palm—about as succulent a breakfast as would be a green umbrella and a *Times* newspaper ". In short, the camel seems to have been born into the world to serve the needs of man in desert places.

The camel is one of the oldest mammals remaining on the earth. At present it is found in Egypt, Abyssinia, Algiers and Morocco, Arabia, Syria and parts of Asia Minor, Central Asia and India, and in these regions it must have been one of the earliest of domesticated animals. It appears on the sculptures of Nineveh, and is often mentioned in the Bible. The Arabs cultivate several breeds for different purposes, the chief of them being a stoutly

built, slow-paced camel for carrying heavy loads, and the dromedary, the racehorse of its species, celebrated for its speed, and capable of carrying its rider 100 miles in a day.

The training of the camel usually begins in its fourth year, when it is taught to kneel and rise at given signals and to bear loads of increasing weight. A trained beast will carry, according to its size, a weight of from 500 to 1000 pounds for 25 miles a day. When the deadly sand-storm approaches, the camel sinks instinctively upon its knees and, tightly closing its nostrils, remains motionless, while its driver, covering his face with his garments, crouches under such shelter as its body affords. When the caravan is in danger of perishing from thirst the camel can smell water, if there be any within a mile, and will go for it even if he has to break his halter to do so.

" He takes no heed ", says Palgrave, " of his rider, pays no attention whether he be on his back or not, walks straight on when once set agoing, merely because he is too stupid to turn aside, and then, should some tempting thorn or green branch allure him out of his path, continues to walk on in the new direction because he is too dull to turn back into the right road. In a word, he is from first to last an undomesticated and savage animal, rendered serviceable by stupidity alone without much skill on his master's part, or any co-operation on his own save that of an extreme passiveness." The entertaining author of *Life Among the Pandies*, quoted by the Rev. J. G. Wood in his Natural History, gives the camel an equally bad character for temper. " I have no hesitation in saying that never do I remember to have seen a camel in a good humour or otherwise than in open or moody hostility with the world at large; at least, if outward appearances are to be credited. Watch him when he is being loaded; see his keeper struggling frantically with him, only succeeding in making him kneel down for the purpose by sheer force, and when down only keeping him there by tying neck and fore-legs together with

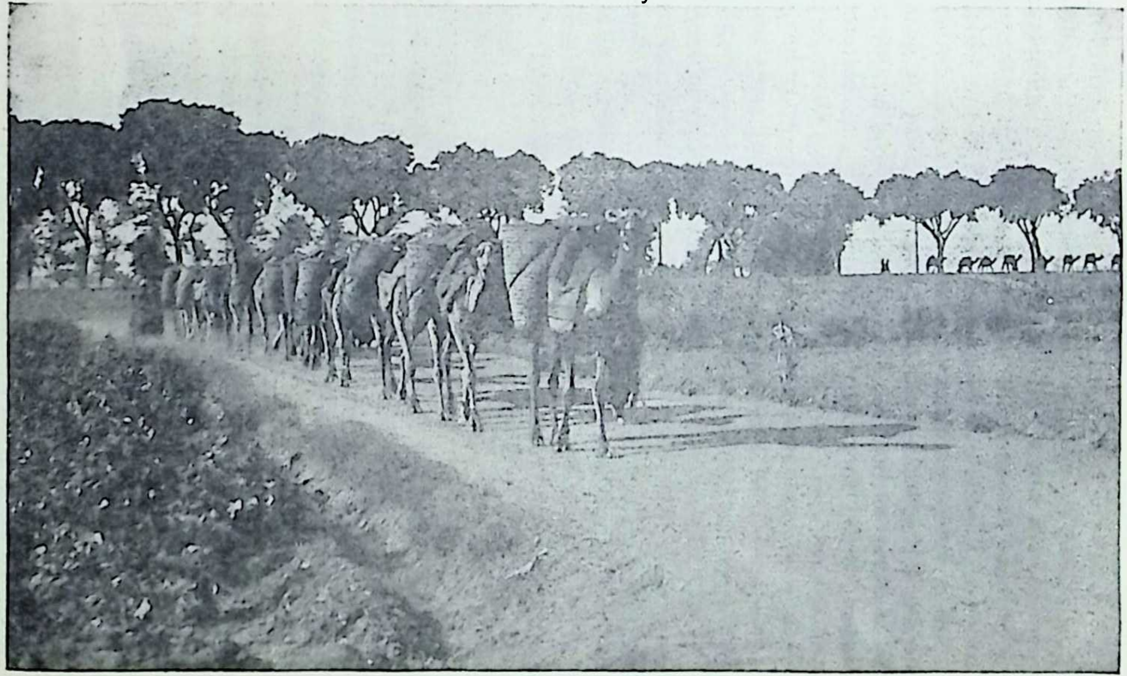


Photo. Boyer

The "Ship of the Desert"—a cotton caravan in Egypt

a piece of string; hear him grumbling in deep bubbling tones, with mouth savagely opened, and I think that then at least you will admit he is by no means in as amiable a frame of mind as one could wish. Observe him now that the process of loading is completed, and the string which held him in subjection loosened; up he rises, a great brown mountain, still groaning, still bubbling, and away he goes, madly dashing to and fro, and shaking off tables, portmanteaux, beds, furniture, and baggage in a scattered shower around him; and I think that even his staunchest admirers will allow that neither at this moment is he in what one would call a pleasant humour. After some battling, having been overcome and compelled to carry the load to which he so objected, but not until he has damaged it considerably, Mr. Camel arrives when the march is over at the camping-ground. It is then necessary to make him kneel down to have that load removed, grumbling as much as ever, in opposition as usual, beaten physically, but with soul unsubdued, and internally in a state of rebellion and mutiny, a sort of volcano ready at any moment to burst forth."

Poor old camel! It seems ungracious to hold up to ridicule and contempt so ancient and distinguished a servant of mankind—a servant who carried the Patriarchs of Israel on his back, who marched with Xerxes into Greece, and who contributed more than any other quadruped to promote the commercial grandeur of the golden East.

Camel caravans move from camping-ground to camping-ground across the plains of Africa and Arabia, as surely and as regularly as the goods trains rumble over our own sweet countryside. They have their times for assembling, for moving on, for breaking up. They always follow the same lines; they have their junctions, where the trains divide for many markets. They have been the goods trains of the desert places of the earth for centuries, and doubtless they will hold their place in the world's traffic for centuries yet.

Timbuctoo, a famous entrepôt for caravan traffic, has been seldom visited by European travellers. Like Lhasa it is one of the forbidden cities of the world, and our knowledge of it is still very limited. Once upon a time this great trade centre, standing on the fringe of the Sahara so far from everywhere that counts (according to our notions), was not only far more important than at present, but must have ranked as one of the largest cities in the world. Even now, though but a skeleton of what it once was, it has a circumference of about three miles. Its houses are mud hovels, yet it has magnificent mosques. Its inhabitants are savages and semi-savages—Berbers, Tuaregs, and a dozen other desert peoples—but in spite of this, this strange city has a close connection with Britain, is bound to us, not by love, nor by diplomatic treaties, but by the tie that binds all countries—the world-wide tie of commerce and the instrument of commerce with which this book deals. Your knives are wanted in Timbuctoo, O Sheffield! What shall the camels bring you in return? Gold or ostrich feathers, ivory or sweet-smelling gums? Do up your bales with care, dame Manchester, for the heat and cold of the desert journey will sorely try the worth of your cotton goods. And you, Miss Birmingham, what message will you send to the mystic city along with your packages of smallware?

Sometimes camels are harnessed to wagons, or to a sort of omnibus. Travelling in such conveyances is considered to be a vast improvement on riding on the beast's back; but probably the most comfortable method of camel travelling is that adopted by the dwellers on the dreadful Kirghiz steppes of Turkestan, where in winter-time a dwarf species of camel is used to drag sledges over the deep snows.

Although the horse, as geological discoveries have proved, abounded in remote ages in the New as in the Old World, it had entirely disappeared from America before the introduction of man into that continent. The peoples of Mexico and Peru had never seen or heard of the horse, and there

was no record of such a quadruped in the hieroglyphics of their ancient monuments. Their only domesticated hoofed animal was the llama, which is still in use in those countries, although as a beast of burden it has been to a great extent supplanted by the ass, the ox, and the mule. In general appearance the llama resembles a sheep almost as much as a camel. It has no hump, but it bears its share of the camel's reputation for ill humour. Moreover, it has an extremely disagreeable habit of spitting in the face of persons whose presence is obnoxious to it. It is said to be capable of carrying a load of 100 pounds for 14 or 15 miles a day.

Two species of elephant, the African and the Indian, are the sole surviving representatives of a family which was once distributed throughout the world almost as widely as the horse; and of the two species the Indian elephant only is now employed in the service of man. The mammoth, the ancestor of the Indian elephant, must have been at one period quite a common object of the English landscape, for his remains have been found abundantly in these islands, where he coexisted with the early human inhabitants. In Siberia his tusks are found so frequently as to form an important article of trade, supplying, it is said, nearly all the ivory used in Russia.

For ages the elephant has ceased to be a native of Europe, and has confined himself to the tropical areas of Asia and Africa. He appears in the earliest records of the monarchs of India, by whom he was used chiefly for war. Elephants figured in the Asiatic armies opposed to Alexander the Great, three hundred and twenty years before Christ. Ere long the Romans themselves learnt to use elephants in war, while exhibitions of their sagacity frequently entertained the populace in times of peace. They were called "Lucanian oxen". Cæsar is said to have brought an elephant to Britain, and to have used it in forcing the passage of the Thames when the Romans were opposed by Cassivelaunus. The Romans caused the elephant to advance wearing an

iron coat of mail, and carrying bowmen and slingers in a castle on his back, whereupon the Britons fled panic-stricken.

In modern warfare the use of the elephant is confined to the Indian Army, where he is utilized mainly for the carriage of mountain guns and the traction of heavier artillery. It is, however, as an instrument of peaceful rather than of military transport that he claims our attention in these pages. In that respect also his services, great though they have been, must be referred mainly to the past, for excepting in the haulage of very heavy loads in unopened country he cannot compete economically with the horse or the mule. " As a beast of burden ", says Sir E. Tennent, " he is unsatisfactory. His skin is easily chafed by harness, especially in wet weather. Either during long droughts, or too much moisture, his feet are liable to sores, which render him non-effective for months. . . . On the whole there may be a question as to the prudence or economy of maintaining a stud of elephants for the purposes to which they are assigned in Ceylon."

In short, the domesticated elephant, surprising as the fact may seem, in view of the thickness of his hide and the immensity of his bulk, suffers from a delicate constitution. Moreover, his appetite being in proportion to his size, he is a very costly animal to keep. For these reasons his employment as a beast of burden is gradually decreasing. Nevertheless in all work which requires the application of great strength combined with singular judgment the elephant is supreme among quadrupeds. He can be trained to build a wall of stones, course by course, not less evenly and far more quickly than you or I could build it; and he will pile logs of timber with a regularity that could not be surpassed by the most expert lumberman. Indeed, the elephant's services to transport have been no less great in the construction of bridges and roads than in the ordinary conveyance of commodities.

CHAPTER III

Roads and Roadmakers

I suspect that the first transport problem which presented itself to man was in connection with the filling of his larder.

Having killed his big game and eaten as much of it as he could, the primitive hunter would find himself face to face with the question of transport. If he could remove the carcass to the neighbourhood of his dwelling, or some other place of comparative security, it would afford him meat for many days—in an arctic climate for months. He would naturally try to save as much of it as he could. The tusks, teeth, and bones would be useful to him for making weapons, but these, if there were no other men about, would stay where they were till he wanted them. The hide he must remove at once, and as much of the meat as possible. His natural course would be to skin the carcass, to lay upon the skin or a part of it what a butcher calls the "primest cuts", and to drag his booty laboriously home, using the hide, in fact, as a sledge. In course of time he would discover how to make a better sledge on the plan of that used by the Eskimo to-day. This sledge has two runners of wood or bone, united by cross-pieces tied to them by hide thongs. Maclure relates an instance in which two salmon, frozen as hard as the ice itself, were successfully used as runners.

In Scandinavia and other parts of Northern Europe, in

Siberia and in Canada, much larger and heavier sleighs are used for winter traffic. For transporting a heavy load downhill or on a hard level surface, even if not snow-covered, a sledge of some sort is better than no vehicle of any sort. This fact, and the ease with which a sledge can be made, point to the use of this contrivance, as I stated in Chapter I, long before the invention of the wheeled vehicle, and probably before the practice of placing burdens upon the backs of quadrupeds. When Prehistoric Man began to domesticate the animals, to harness them with thongs to his sledges, and to accustom them to carry loads upon their backs, he was further advanced in the science of transport than some of the savage peoples who are to be found in the world in our own time.

The invention of the wheel and axle marks a stage in man's progress no less important in its way than the discovery of steam power. The first wheel, perhaps, was a loose roller—a piece of the trunk of a small tree, roughly smoothed with a bronze or iron axe, and laid beneath the burden which was to be moved. The great blocks of stone used in building Stonehenge were probably transported in this way, on a number of loose rollers, each roller as it escaped at the rear of the burden being brought to the front again by hand. We know that this method was employed in ancient Egypt for the overland transport of building materials, and it is commonly practised in our own time and country whenever pieces of machinery or other heavy articles have to be moved a few yards without the assistance of a crane.

Prehistoric Man, in places where suitable timber grew, would find that with the aid of a round log or two he could haul a heavily-laden sledge over ground which was otherwise impassable. When he discovered a means of attaching the roller beneath the sledge in such a way that it would revolve freely without altering its relative position he had invented the cart.

When the first pages of history are opened, and the veil

is lifted upon civilized man, we find that in one part of the world, at all events, the arts of the wheelwright and the carriage-builder were flourishing. The ancient Babylonian and Assyrian sculptures show that beautifully-finished wheeled vehicles were in use both for warlike and for peaceful purposes more than fifteen hundred years before Christ.

The Persians, besides chariots carrying two persons, sometimes drawn by four horses, used a carriage drawn by a single mule or more, and consisting of a platform on high wheels, large enough to carry five or six persons.

The chariot was, as we have seen, a horse-drawn vehicle, designed first of all for purposes of war. The use of carts for the conveyance of agricultural produce was probably much earlier than the invention of the lordly chariot. What was perhaps one of the earliest forms of the cart is still to be seen in India, where it is known as the *suggar*. This has two wheels of solid wood, built up of two or more pieces, which revolve upon a wooden axle-tree. The ox carts pictured in the monuments of ancient Assyria and Egypt were an improvement upon this. Pliny tells us that four-wheeled carts were invented by the Phrygians at some period before the Trojan War. Perhaps the mule-cart in which, as the Homeric poem tells us, Nausicaa took her linen to the wash was of this kind.

The carts or wagons of the Israelites were probably built on the lines of those which they had seen in Egypt. There is evidence in the Bible (*Amos*, ii, 13) that carts were employed for agricultural purposes, but their utility for transport over long distances must have been greatly restricted by the inferiority of the roads. The trade of those days was mostly in goods which could be packed in sacks or small parcels, and for the transport of these, pack animals were preferred to wheeled vehicles.

That there were roads of some sort in those early days of civilization we may take for granted. The word which

is translated "way" in our English Bible really means highway or road. The Assyrians and Egyptians were capable of making very substantial roads. Herodotus tells us, for instance, that for the building of the Great Pyramid, about 4000 years before Christ, a road or causeway was made between the site of the Pyramid and the quarries of Turah, three-quarters of a mile away, and that it was so solid that its construction occupied 100,000 men for ten years. Nevertheless the idea of opening up the trade of their countries by any general system of roadmaking does not seem to have occurred to the rulers of the ancient East. The reasons for this neglect are perhaps to be found in the level character of the natural trade routes, and especially in the dryness of the climate—circumstances which rendered the ground suitable without any artificial treatment for the passage of beasts of burden. In Egypt, moreover, and in Babylonia, the great rivers, Nile, Tigris, and Euphrates, afforded a natural means of transit for the building materials, which alone constituted the heavy traffic of the times.

In spite of the poverty of the roads, overland traffic was carried on, many hundreds of years before the Christian era, between Palestine and Egypt and Arabia, and even India. The Phœnician cities of Tyre and Sidon were the great markets of the Mediterranean shore, and thither the caravans came from all parts of the east and south. Turn to *Ezekiel*, xxvii, and you will see the extent to which trade and transport had been developed in the prophet's day. There were slaves and vessels of brass from what is now known as Georgia; horses and mules from Armenia; ivory, ebony, precious stones and gold from the countries on the Persian Gulf; emeralds, purple and broidered work and fine linen, and coral and agate from Syria; wheat, honey, oil and balm from the interior of Palestine; wine and wool from Damascus; sheep, goats, tools and weapons from Southern Arabia; and from Babylonia "all sorts of things",

blue clothes and broidered work, and "chests of rich apparel bound with cords and made of cedar".

To trace the later development of internal communications we must come farther west. The Romans were the pioneers of roadmaking. In directness of course and solidity of construction their roads have never been excelled, many of them after 2000 years of traffic still remaining either as the foundations of more modern roads or, in some instances, as the very surfaces trodden by twentieth-century feet.

The Romans are said to have adopted their first ideas upon the subject of roadmaking from the Carthaginians; three or four hundred years before the Christian era they had brought the art of roadmaking to a pitch of perfection scarcely surpassed even in our own day. The Roman roads varied, according to their importance, from 8 to 15 feet in width. Above the foundation the road was built up in layers: first, a layer of stones, of which none was smaller than a modern cricket ball; secondly, a layer, 9 inches thick, of broken stones and lime; thirdly, a layer, 6 inches thick, of broken bricks and pottery, the pieces being smaller than the stones in the second layer, but, like them, cemented with lime and rammed down; finally came the pavement, composed of large, many-sided blocks of the hardest stone procurable, fitted together with such nicety as to present a perfectly smooth surface. Regular footpaths were raised upon each side of the road and strewn with gravel; stone blocks were set up at intervals to assist horsemen to mount; and milestones were placed along the whole extent of the great highways, marking the distances from Rome.

The most famous of these Roman roads, and the first road ever laid down upon scientific principles, was the Appian Way, the Great South Road of Italy. This magnificent road, which was begun by Appius Claudius Cæcus in the year 313 B.C., led from Rome through Three Taverns and Appii Forum to Capua, whence it was ultimately ex-

tended to Brundusium, the modern Brindisi, 350 miles from the capital. The cost of the road must have been enormous, for the work involved cutting through hills and masses of solid rock, filling up hollows, bridging ravines, and building embankments over swamps. Three hundred and seventy-five years after the date at which the road was begun, the Apostle Paul, as we read in the *Acts*, passed along it on his way to Rome. For at least five hundred years after Christ, long after the devastating inroads of the northern barbarians, it continued in perfect repair; and in spite of age, neglect, and the plunder of its materials, traces of it are still visible in places.

The Romans were not only the first people to make good roads, they were also—if we except the unproved and unprovable claims of the Chinese to this distinction—the first to apply the principle of the arch to the construction of bridges.

The first instances of arched bridges were probably the Pons Palatinus (127 B.C.) and the Pons Milvius (100 B.C.). Some portions of the last-named bridge remain in the Ponte Molle, as the bridge which occupies its site is now called, while two of the bridges which were built over the Tiber a few years later are still almost intact. From this time onward, until the decay of the empire, splendid bridges were built by the Romans both in Italy and in distant provinces. "They formed", says Mr. Rich, "one of the chief embellishments in all the public roads; and their frequent and stupendous remains, still existing in Italy, Portugal, and Spain, attest, even to the present day, the scale of grandeur with which their works of national utility were always carried on."

It was to the Romans that Britain owed the roads which, if they were not actually the first, were for many centuries the only good roads in the island. It is an interesting fact that although the Roman occupation lasted for more than three hundred years, it has marked our language by only

half a dozen words, all of them concerned with military engineering, and all, I think we may conclude, with things for which neither the Britons nor the Anglo-Saxons had any words of their own. One of those six words is " street ", which represents *strata* (*via*), a paved (road). Another is " fosse ", from *fossa*, a ditch. Wherever in an English country place you find an ancient road or village called " street ", or a road between ditches called a " fosse-way ", you may be almost certain that you are in the footsteps of the Roman conquerors.

Of course the precursor of most roads was the river, which, by dint of running a little and wearing a little every minute for thousands of years, had worn a flat place between two hills. Savage man came to the river to fish and to fetch water, so gradually a firm path became worn along the river bank. In a slightly higher stage of civilization, when men used sledges, the path became wider and firmer. Rough sledges, little altered in design since those primitive times, are still used in the hill districts of Britain. " Fetching the Fern " is an event almost equal in importance to the harvest in some parts of Wales. When the bracken droops red and sere, in the brilliant days at the end of September, men take horses and sledges and go up the hillside. They cut the bracken and load the sledges high up above their heads, and then, when they can load no more, the patient, surefooted horses drag the sledges home down places where it would puzzle you and me to keep our balance. Certainly they have an interest in taking the bracken down safely, for it is to make their beds for the winter. No doubt the same thing was done when men first made sledges, only then the bracken was not bedding for horses, but bedding for man, wife, and children.

England being, generally speaking, a flat country, the old roads do not invariably follow the course of a river. They often imitate the flight of the proverbial crow for a number of miles, and when they show any deviation

from the direct route it is interesting to try to discover the reason.

For example, the Romans had one important point to observe in laying out their roads. The Britons were not yet quite subdued, and would lose no opportunity of striking at their enemies whenever one occurred for a handful of men to damage a disciplined force. For this reason the Romans would never make a road through a forest, for this would entail felling the trees for a wide space on both sides, so that there would be no shelter for spearsmen amongst the branches. Thus, the road from London to Bath made a large circuit to avoid about twenty miles of forest in Buckinghamshire and Oxfordshire. It was not until many years later, when their rule was firmly established, that the Romans ventured to carry their roads through forests, and then they unconsciously wrought, for posterity, almost as much harm as good. They cut down trees which they did not trouble to remove, simply leaving them beside the road. These trees ultimately rotted away, and the masses of decaying vegetation were largely responsible for quagmires and treacherous lands in the future. In our study of the early roads of Britain, or more particularly England, we must not forget to take into consideration the fact that the greater part of the country was covered by either wood or bog. The inhabitants seem to have escaped one evil only, that of desert.

One feature was common to all the Roman roads—their straightness. They were made for men marching on foot, for horse, and for light chariots, so the engineers carried them as nearly as possible in a bee-line from place to place, regarding as of secondary importance the avoidance of sharp ascents and descents. The Roman chariots and private carriages were much better than those of the ancient Assyrians and Egyptians, but carts and wagons were still almost as clumsy as they could be. Notwithstanding the excellence of the roads, the pack horse was the principal means

of carrying goods. Even pigs of lead and ingots of tin were conveyed on horseback from the mines of Derbyshire and Cornwall to the seaports, from which they were shipped to Gaul or Rome.

It is sad to have to relate that for 1500 years or more after the departure of the Romans the magnificent roads which they had made were allowed to fall into decay. As recently as 150 years ago the inland communications of Britain were actually in a worse condition than they had been in the times of the Cæsars. "Down to the middle of the eighteenth century", says Smiles, in his *Lives of the Engineers*, "the trade and commerce of England were comparatively insignificant. . . . The roads of England were then about the worst in Europe, and usually impassable for vehicles during the greater part of the year. Corn, wool, and such like articles were sent to market on horses' or bullocks' backs. The food of London was principally brought from the surrounding country in panniers. The little merchandise transported from place to place was mostly of a light description—the cloths of the West of England, the buttons of Birmingham and Macclesfield, the baizes of Norwich, the cutlery of Sheffield, and the tapes, coatings, and fustians of Manchester."

Well, the Romans came, conquered, made roads, and, in course of time, departed, leaving behind them a country infinitely the better for their rule. Unfortunately there was no one to carry on this wise policy of roadmaking. The roads having been made, they were left to take care of themselves. The only mending which they received would be a load of loose stones thrown down carelessly. Until these had worked into the mud, every conveyance suffered the most horrible jolting while passing over them. Then, the State having failed in its obvious duty, the Church stepped in. The proper maintenance of roads became an object of pious endeavour, and it was considered as much an act of grace as feeding the sick and the poor. Some institutions

took over the care of a particular piece of highway, others maintained bridges. On the Continent a special order of "Bridge-building Friars" was founded. They did much useful work, the bridge over the Rhone at Avignon being attributed to them. At this time originated the custom of building a chapel beside a bridge and dedicating both to the same saint.

At the end of the fourteenth century a further impetus was given to the work by the resolve of laymen to form guilds for the maintenance and repair of bridges and highways. Hermits also did valuable service by establishing themselves near the high-roads and spending their time in roadmending.

Gradually, however, this new-born energy wore itself out. Whatever the cause, roadmaking went out of fashion, and things became worse than ever. It is easy to understand that when the only means of conveyance was the pack-horse, and all journeys were taken on horseback, the state of the roads was of little importance; but as commerce and civilization increased, the use of wheeled vehicles became more and more common. People became too lazy to walk or ride, and could only travel in clumsy carriages. Heavy carts were required to carry merchandise and provisions into the towns, and the bad roads became so cut and broken up as to be impassable except in dry weather. The common law ruled that the inhabitants of a parish must repair the highways within their boundaries, but so inexplicit an obligation was naturally shelved.

The Romans left Britain in 411, and over eleven hundred years elapsed before any definite system of road repair was organized. It speaks well for the solidity of the Roman roads that after ages of neglect they were still capable of renewal. As we have seen, the only mending the roads had in the meantime was that of private and voluntary endeavour, or half-hearted, and often wholly inefficient, compulsory labour under the common law. The first

Act passed in connection with highways is a statute of Edward I, which did nothing to improve the surface, but is interesting as recalling an almost forgotten aspect of travelling. It decreed that "there be neither dyke, tree, nor bush whereby a man may lurk to do hurt within two hundred feet on either side of the way". That was in 1285, and no further notice was taken of the state of the roads until 1346, when Edward III instituted a system of tolls for the maintenance of three roads in London.

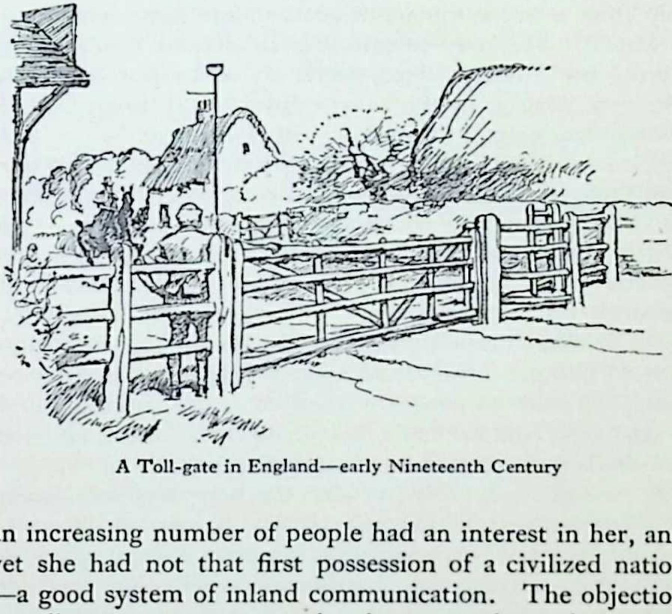
In 1364 William Philippe the Hermit was authorized to collect tolls for the maintenance of the Hollow Way from all who passed between "Heghgate and Smethfelde". From this onward the roads began to improve, until in 1663 a very important measure was passed. This was the First Turnpike Act, which only applied to the counties of Hertford, Cambridge, and Huntingdon. In each of these counties surveyors were appointed who had to provide materials for the repair of the roads and enforce the general law that landowners should supply carts, labour, and tools. This system was ultimately developed until the turnpike roads spread all over the country, making history in their course, as we shall see.

Naturally, there was hostility to the paying of tolls, and apparently people would rather do anything than pay for the mending of the roads. In a subsequent chapter we shall have something to say about wheels, but while we are on the subject of roads we must mention that the broad wheels which were compulsory in the reign of George II were expected to have a twofold effect. They were considered less harmful to the road than narrow wheels, which in a soft place would make a deep cut; and also the weight and breadth of them was considered sufficient to roll in the loose stones with which the road was mended.

Under George III an Act was passed to the effect that vehicles provided with 16-inch wheels should go toll-free for five years, and should pay only half fees afterwards.

However, in 1804, William Jessop wrote: "Of all the barbarous and abominable machines that have been contrived by ignorance and maintained by vulgar prejudice, none have equalled the broad-wheeled carriages that are now in use; instead of rolling the roads, they grind them into mud and dust".

Poor old England! She had commerce and prosperity,



A Toll-gate in England—early Nineteenth Century

an increasing number of people had an interest in her, and yet she had not that first possession of a civilized nation—a good system of inland communication. The objection to toll gates was so great that in many places there were serious riots and the gates were burned down. It is obvious from the number of Turnpike Acts passed that Parliament was seriously concerned about the state of the roads, but it appears that their anxiety was more to mend the old roads than to provide new ones, which would be laid in such a way as to overcome the defects hitherto common to all roads.

The roads were not roads so much as tracks; and when

the old tracks became dangerous through depth of mud, new tracks were struck out across the adjoining fields. In 1763 the only public conveyance between Edinburgh and London was one coach, which set out once a month and occupied nearly a fortnight on the journey. Writing about this time, an English tourist named Arthur Young describes a turnpike road cut up with ruts, " which ", he says, " I actually measured four feet deep, and floating with mud only from a wet summer; what therefore must it be after a winter? The only mending it receives is tumbling in some loose stones, which serve no other purpose than jolting a carriage in the most intolerable manner. . . . I passed three carts, broken down, in eighteen miles." The high-roads of the country at this period were actually worse than those of China and Peru, and were beset by highwaymen who lay in wait where the going was heaviest, so as to take the tired travellers at the greater disadvantage. Matters were little better even in the neighbourhood of the great towns.

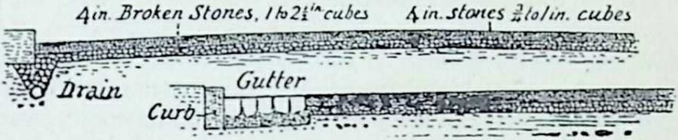
Sir William Parnell wrote in his *Treatise on Roads*, in 1833: " While, however, England has been content to suffer her roads to be in so defective a state, Scotland and Ireland have acted far otherwise, and for a long time have had the benefit of a more improved system ".

It is rather a curious fact that the first improvement in the means of inland transport in Europe was not in road-making, but in the opening of canals. Holland, France, and Russia led the way in this movement. It was not until 150 years ago that the enterprise and wealth of the Duke of Bridgewater and the genius of his engineer, James Brindley, made the beginning of our system of canals, which before the coming of the railway afforded the cheapest and quickest means for the transport of heavy goods.

The opening of the canal system was very soon followed by a vast improvement in the long-neglected roads, or perhaps it would be more correct to say by the first

systematic and scientific roadmaking that had been attempted since Roman times. Telford and Macadam are the Fathers of our modern roads.

Telford compared roads to houses or cathedrals. He argued that as no one would expect a building to stand that had not its foundations firmly fixed, neither ought anyone to expect a road to support the weight of heavy traffic without a solid base to rest upon. Macadam, on the other hand, who was a contemporary of Telford's, paid most of his attention to the surface of the road, and cared little for the foundation. The principle of Macadam's system was the use of stones broken very small into sharp pieces. Smooth, rounded stones do not bind, they always remain distinct, but angular stones bind and grind into one another to form a thick crust. This crust he considered would keep dry if it were laid dry, and he did not pay much attention to drainage. It was at this point that the two theories of Telford and Macadam met, and in practice it was soon proved that the methods of both used in conjunction would combine to form a perfect road. I am afraid we do not think much about Telford to-day, but we remember Macadam every time we refer to macadamized roads—that is, roads covered by a layer of " metal " or angular stones.



Sections of Two Types of Macadam Roads

The work of Telford and Macadam introduced the palmy days of the coaching era. Telford died in 1834, Macadam in 1836. They created a great revolution in our inland communications, and they lived to see the beginning of another revolution that was to be greater still.

CHAPTER IV

Road Vehicles

A vehicle of any sort is a modern invention. You must not take this to mean that the cart is not many centuries old. Its origin, indeed, is lost in the clouds of mystery that swathe all ancient inventions; but we cannot get away from the fact that the means to make a wheeled contrivance of any sort belongs necessarily to a high state of civilization.

What were the first wheels like? Where were they made and by whom? Puzzling questions to answer, these, because we can only answer them by conjecture. A wheel is a complicated piece of mechanism, in spite of its simple appearance, and requires from its maker a high degree of skill and knowledge of carpentry. The simplest form of wheel would be cut from a section of tree-trunk. Next, the early wheelwright would learn to make his wheels whatever size he wanted them by joining several shaped sections together. We may be quite sure that the wheel built up of nave and spokes and felloes was a much later invention, by which time chariot-building had been developed to a fine art.

The oldest reference we have to the use of war chariots is in *Exodus*, xiv, 6, 7, where we read of the "chariots of Egypt" (1491 B.C.).

The Roman chariot (*currus*) closely followed the Egyptian in shape. It was uncovered and built high in the front, and would carry one or two people, standing up. A *biga*

was a two-horse chariot, for war or racing, a *triga* was a three-horse chariot, and a *quadriga* was drawn by four horses abreast, two of which were yoked while two were attached by ropes. This was the chariot generally used in circuses and processions. Under the date 55 B.C. in *The Student's Hume* we find the following account of the war chariots of the ancient Britons:—

"They (the Britons) fought from chariots . . . having scythes affixed to the axles. The warrior drove the chariot, and was attended by a servant who carried his weapons. The dexterity of the charioteers excited the admiration of the Romans. They would urge their horses at full speed down the steepest hills or along the edge of precipices, and check and turn them in full career. Sometimes they would run along the pole, or seat themselves on the yoke, and instantly, if necessary, regain the chariot. Frequently after breaking the enemy's ranks they would leap down and fight on foot; meanwhile the chariots were withdrawn from the fray, and posted in such a manner as to afford a secure retreat in case of need; thus enabling them to combine the rapid evolutions of cavalry with the steady firmness of infantry."

Needless to say, carts came before the more elaborate chariots; but carts are of little use when there are no roads on which they may run. The one-horse cart as we know it to-day reached its highest development in Scotland towards the close of the eighteenth century. While the heavy and clumsy four-wheeled wagon was the principal means of transporting all kinds of merchandise in England, the Scottish carriers evolved a much lighter and more economical conveyance, which was admirably adapted for the hilly roads of their country. In England the tendency was for the carts and wagons to become heavier and heavier, until the wagon-builders' efforts resulted in a machine which served the double purpose of conveyance and road roller, as we saw in the last chapter. These heavy carts

and wagons were forever getting stuck in the mud which they themselves helped to bring into being, and it took several horses to drag them slowly and ponderously over the country. They were drawn by four or six horses, and travelled at walking pace. The driver—who, by the by, did not drive in the ordinary sense, since there were no reins—either rode on the leading horse or was seated on a pony which walked beside the horses. There was always provision for passengers on these wagons. They sat or reclined huddled up together on a bed of straw.

The first record of a modern carriage is in the year 1280, when, on the entrance of Charles of Anjou into Naples, his queen rode in a small decorated car. Evidently the the idea "caught on", and the great ladies who adopted the carriage found themselves being copied by all and sundry, for in 1294 an edict was issued forbidding the wives of citizens to use "chars". In 1555 Walter Ripon made a carriage for the Earl of Rutland. It was the first of the small "chars" seen in England, and later on he was commissioned to make one for Queen Mary.

Queen Elizabeth's first state carriage was in shape much like the modern ones, but though it had a roof it was quite open at the sides. Later in her reign a coach was made for her with sliding panels, so that she could smile on her subjects or shut out the rain as she felt inclined. Even so her coach must have left something to be desired, for on one occasion at least we hear of her complaining of "aching pains" due to having been "knocked about" in her coach. Indeed, when we think of the deplorable condition of the roads at that time, and the springlessness of the carriage, it is to be wondered at that she ever drove when she might ride or walk. Carriages came into very general use during the next hundred years.

By the middle of the sixteenth century they must have been common in France and Italy, though they were not much used in England; and about 1564 we first hear of

long wains or wagons for the carriage of bulky goods, and of people who were not able to travel in any other way. They had accommodation for about twenty persons; they were very slow, and must have been very uncomfortable. The journey from London to Dover took three or four days, and that from London to Bristol six days. These wagons, like the stage-coaches, travelled by day only; and the passengers had to find themselves lodgings for the night. This explains to us the use of the huge inns standing, in a decayed and half-deserted condition, on the great main roads. The stage-coaches would stop at definite points with a certain amount of punctuality, but the wagons slumbered and loitered without much regard for time and the convenience of their patrons.

The very wealthy only could afford the most luxurious mode of travelling, that of posting, and it is not likely that this came into vogue much before the eighteenth century, when something, however little, was being done to improve the roads. It is calculated that it cost £30 to post from London to Edinburgh. In 1625 we first hear of hackney carriages for hire in London. There were only twenty of them, and they could only be hired from the stables of the owner. It was not until 1634 that they were allowed to remain in the streets and ply for hire.

At last the number of private and hackney coaches became so great that " the streets of our cities of London and Westminster and their suburbs are of late so much encumbered with the unnecessary multitude of coaches that many of our subjects are thereby exposed to great danger, and the necessary use of carts and carriages for provisions thereby much hindered ". The outcome of this state of affairs was the importation in 1634 of the sedan chair. The use of this convenient mode of conveyance cleared the narrow uneven streets of a great many clumsy vehicles, to the immense benefit of pedestrians.

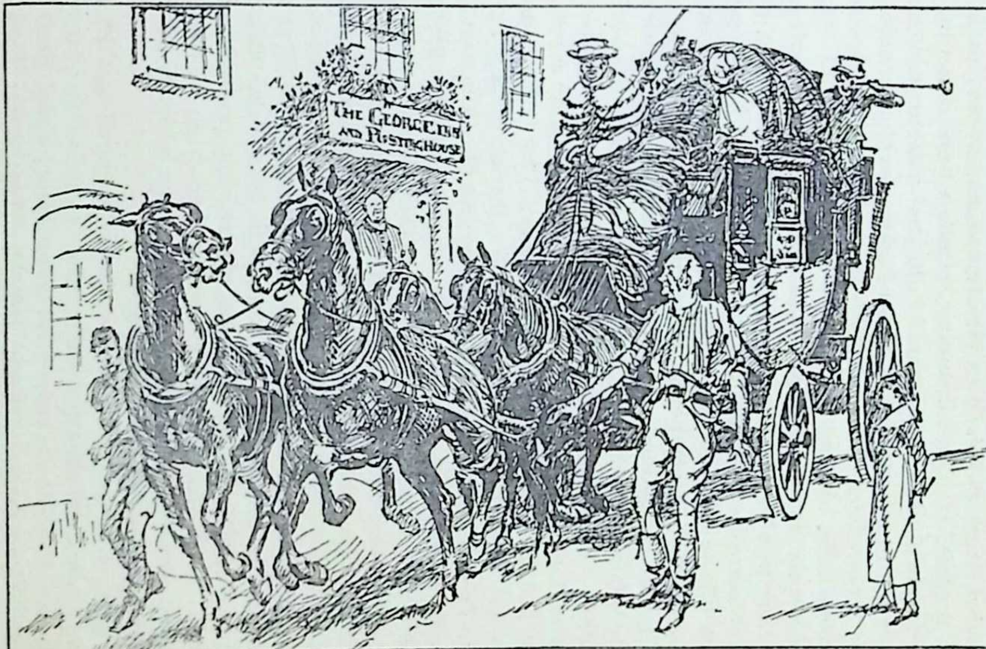
To return to our coaches. The first stage-coach set out

from Coventry in 1659. It was not remarkable for speed, but rather for slowness, its average rate of progression being about 3 miles an hour. The roads were still so bad that it was impossible to go fast, and the coaches themselves were so hard and rigid that anything beyond the gentlest speed would have greatly increased the discomforts of travelling. In 1784 the regulation pace was 6 miles an hour, but as Macadam and Telford improved the roads, so did the speed increase, until at last it was brought up to 10 miles an hour.

There was, of course, hostility to the coaches. One alarmist wrote: "Travelling in these Coaches can neither prove advantageous to Men's Health or Business; For what Advantage is it to Men's Health to be called out of their beds into these Coaches, an Hour before Day in the Morning, to be hurried in them from Place to Place till one Hour, two or three within Night; insomuch that, after sitting all Day in the Summertime stifled with Heat and choaked with Dust; or in the Wintertime starving and freezing with cold, or choaked with filthy Fogs, they are often brought into their Inns by Torchlight, when it is too late to sit up to get a Supper; and next Morning they are forced into the Coach so early, that they can get no Breakfast?"

Improvements in coachbuilding were a natural result of the increase in travel and communication. At first, as we have seen, the coaches were merely wooden structures, guiltless of springs, with heavy wheels. Early in the eighteenth century a great advance was made by the introduction of leather straps on which the body of the coach was slung. Later on these straps were attached to C springs. Elliptic springs such as are used nowadays for carriages were invented in 1804.

Coaching reached its highest pitch in England in the years immediately preceding Queen Victoria's accession. This was a time when, in a period of peace following long and weary wars, the people of our country looked about for



English Stage-coach, early Nineteenth Century

means of recovering from the weakness and poverty that war always entails—even to victorious nations—and found it in the genius of her inventors. Looms were humming, iron furnaces were roaring, and industrial enterprises were springing up everywhere. And, of course, with increasing trade there came increasing need for travel, and the postal services of the country were generally " speeded up ". On all the more important routes the coaches were accelerated. But, in spite of good going, a journey from London to Leeds occupied twenty-two hours. To-day, the fastest trains of the Midland Railway take something under four hours for the journey between the same places.

Thomas De Quincey has left us a very vivid account of the coaching days in his essay on " The English Mail Coach ". " From 8 p.m. to fifteen or twenty minutes later imagine the mails assembled on parade in Lombard Street, where, at that time, was seated the General Post Office. In what exact strength we mustered I do not remember, but from the length of each separate *attelage*, we filled the street, though a long one, and though we were drawn up in double file. On any night the spectacle was beautiful. The absolute perfection of all the appointments about the carriages and the harness, and the magnificence of the horses, were what might first have fixed the attention. Every carriage on every morning in the year was taken down to an inspector for examination—wheels, axles, linchpins, pole, glasses, &c., were all critically probed and tested. Every part of every carriage had been cleaned, every horse had been groomed with as much vigour as if he belonged to a private gentleman.

" Every moment are shouted aloud by the Post Office servants the great ancestral names of cities known to history through a thousand years—Lincoln, Winchester, Portsmouth, Gloucester, Oxford, Bristol, Manchester, York, Newcastle, Edinburgh, Perth, Glasgow—expressing the grandeur of the empire by the antiquity of its towns, and

the grandeur of the mail establishment by the diffusive radiation of its separate missions. Every moment you hear the thunder of lids locked down upon the mail bags. That sound to each individual mail is the signal for drawing off, which process is the finest part of the whole spectacle. Then come the horses into play."

Surely it was pleasant to bowl through the sweet pastoral lands of the home counties, through the shade of deep woodlands; to feel the sea breeze as they sped by the seashore, to climb over bleak moors while the peewits tumbled and screamed around them and the curlews chorused their lament. But at bottom, was it so jolly? What about the wet days and the stormy nights, and the aches and pains, the tedium of body and mind that crept on as the milestones dropped back?

We are always meeting with stupid people who lament the passing of the "good old days" and the romance of a hundred years ago; who whine because they can't be conveyed uncomfortably in coaches, but have now to travel in ease along a nasty prosaic railway. Romance didn't die with the mail coaches; he wasn't stifled with steam-engine smoke. The mailcoach days were the halcyon days of the English roads; and it needed the birth of the railway system to bring road travel to its highest pitch. It was, in fact, the threat of the ultimate disuse of the roads and all that pertained to them that urged the coach proprietors to quicken their services and lower their fares.

In another chapter we shall tell how bitter was the coaches' struggle for existence with the locomotive, and how hardly the railway pioneers gained the grandest victory ever won in industrial history. And then, when at length the victory was won, it was a long, long time before wiseacres ceased to shake their heads and lament the decadence of travel, forgetting that wiseacres had done just the same thing two centuries earlier. The locomotives

and their trains were hideous and unholy, the tranquillity of the landscape was spoiled for ever by the sacrilegious hands of the railway builders. "Alas!" they sighed, "*our* way of getting about was beautiful; the new way is hideous. Who wants to be whirled along an iron track at twice or thrice the old speed? What good will it do?" And much more to the same effect.

But beauty never graced exclusively a single period of man's progress, nor shall it ever; for beauty, as Emerson said of it, "will come as always, unannounced, and spring up between the feet of brave and earnest men". Which, think you, is the more beautiful: the organization that in 1839 carried a lover's letter to his lass at a cost of a shilling, two shillings, or even five shillings if she lived in the north of Scotland, or that which in 1840 carried the same message for a penny?

There have been so many stages in the development of wheeled vehicles that we can do no more than glance at the more interesting of them, before we leave the instruments of transport that are past or passing for the mightier machines that make our own lives possible. I am not sure that cabs and carriages for personal travel are entitled to a place in our book. There seems to be a stuffiness and a stodginess about the very names. You know, probably, that our word cab is a contraction of *cabriolet*, vulgarly called "cabrioily" in our fathers' day. These conveyances were introduced into England from Paris in 1820, but they were invented much earlier than that, for a Count Gozzadini wrote in 1672 that a cabriolet, "an affair with a curved seat fixed in two long bending shafts, placed in front on the back of a horse, and behind on two wheels", was seen for the first time in Florence. The *cabriolet de place* was first used in Paris about the middle of the seventeenth century.

The hansom cab, so called from the name of its inventor, was patented in 1834. It was originally a square body

supported on two huge wheels, about $7\frac{1}{2}$ feet in diameter, and it was of course innocent of the modern sliding front and rubber tires. A three-wheeled cab was licensed in 1887, but never came into favour.

Probably the most luxurious carriage ever invented was the *britska* or *calèche*, which was used by our grandfathers —or the few very wealthy ones among them—for the "Grand Tour" that was supposed to put the last touch to a gentleman's education. These were light vehicles, with long bodies, in which a passenger might recline, beautifully upholstered, and fitted with all the devices that the wit of travellers and the skill of coachmakers could devise to ensure luxurious journeying. A good *calèche* cost between three and four hundred pounds—the price for which a good touring motor-car can now be bought.

The Far East can show us some very queer vehicles—queer to our ideas of what vehicles should be like; how the Chinaman may have regarded an English coach we learn (with a pinch of salt) from that essay of De Quincey's from which I have quoted already:

"Amongst the presents carried out by our first embassy to China was a state coach. It had been specially selected as a personal gift by George III; but the exact mode of using it was an intense mystery to Pekin. The ambassador, indeed (Lord Macartney), had given some imperfect explanations upon this point; but, as His Excellency communicated these in a diplomatic whisper at the very moment of his departure, the celestial intellect was very feebly illuminated, and it became necessary to call a cabinet council on the grand state question, 'Where was the emperor to sit?' The hammer-cloth happened to be unusually gorgeous; and partly on that consideration, but partly also because the box offered the most elevated seat, was nearest to the moon, and undeniably went foremost, it was resolved by acclamation that the box was the imperial throne, and for the scoundrel who drove, he might sit

where he could find a perch. The horses, therefore, being harnessed, solemnly his Imperial Majesty ascended his new English throne, under a flourish of trumpets, having the first lord of the treasury on his right hand, and the chief jester on his left.

"Pekin gloried in the spectacle; and in the whole flowery people, constructively present by representation, there was but one discontented person, and that was the coachman. This mutinous individual audaciously shouted: 'Where am I to sit?' But the privy council, incensed by his disloyalty, unanimously opened the door, and kicked him into the inside. He had all the inside places to himself; but such is the cupidity of ambition, that he was still dissatisfied. 'I say,' he cried out in an extempore petition addressed to the Emperor through the window—'I say, how am I to catch hold of the reins?' 'Anyhow,' was the Imperial answer; 'don't trouble me, man, in my glory. How catch the reins? Why, through the windows, through the keyholes—anyhow!' Finally, this contumacious coachman lengthened the check-strings into a sort of jury-reins communicating with the horses; with these he drove as steadily as Pekin had any right to expect.

"The Emperor returned after the briefest of circuits; he descended in great pomp from his throne, with the severest resolution never to remount it. A public thanksgiving was ordered for His Majesty's happy escape from the disease of broken neck, and the state coach was dedicated thenceforward as a votive offering to the god Fo, Fo—whom the learned more accurately call Fi, Fi."

CHAPTER V

Steam and Petrol take the Road

Of all the wonders that the story of transport can show us, none is greater than the taming of steam. Every time you get on to a train or a steamer—aye, even a motor-bus—you are expressing by your action indebtedness to the men who burnt their fingers for your benefit long ago.

One of these men was Nicholas Joseph Cugnot, a Frenchman to whom belongs the honour of making the first steam carriage—at least the first that would go. This was in 1769. It was a very queer-looking thing carried on three wheels, with a big copper boiler, rather like a tar boiler, in front. It was tried in 1770 in the streets of Paris, and the trial was attended by many notabilities of the day. The carriage took four passengers at a speed of about 3 miles an hour—a nice, easy walking pace. What did the crowd of bystanders, that saw it, make of the first self-propelled carriage? Were hats flung high in the air and voices raised in a tumultuous shout of triumph? No; I am afraid there were no grandiloquent praises for the inventor, but quips and jeers at his expense, and sullen looks or silent wonder as the machine moved on; moved on laboriously, unsteadily—but *of its own accord*. That was the marvel of it, the startling mystery of the life in the ungainly monster.

To us it is infinitely noble, that first rude germ of a power which, in less than a century, was to make a new world. But to the mob that saw the trial of Cugnot's steam-carriage

there was nothing grand or noble in the spectacle. The machine was sinister, uncanny, an engine of the devil, because it moved by an unknown power. Cugnot was put in prison because his carriage ran into a brick wall and knocked it down, so his judges said; and it provided them with a good excuse for keeping out of mischief a very dangerous man of diabolical works.

We must pass over the plans and aims of several inventors until we come to the year 1784, when the famous engineer and inventor William Murdoch made a model of a steam-carriage. This was in appearance like a miniature tricycle. Doubtless you have seen a picture or replica of Murdoch's model; and you may have heard the story of how, one very dark night when the inventor was trying it on a lonely Cornish road, it ran away from him, and meeting a clergyman on its way nearly frightened the poor man out of his wits.

It was left to one of Murdoch's pupils to show the world what could really be done in this direction. This pupil was the great Richard Trevithick, a very remarkable man, the greatest mechanical genius probably that the world has ever seen—a greater genius than Murdoch, or more famous James Watt, or George Stephenson—greater even than Brunel, whom he somewhat resembled in the breadth of his ideas and the startling turns they took. Of course Trevithick's contemporaries said that he was mad; that was a tribute to his genius. As I write I have before me a portrait of this mighty Cornishman—mighty in body as well as in mind. He was an enormous man—he stood 6 feet 2 inches high and had a giant's physique; and his portrait shows him to have had a countenance befitting so great a person. It was too heavy to be handsome, but that it was commanding I make not a doubt.

And what did this great man do? you ask. He built the first high-pressure steam-engine, as great an advance on Watt's engines as Watt's were on Newcomen's. He

built the first road locomotive that carried passengers in England; and he built the first *railway* locomotive. All these things marked vital epochs in history. Trevithick bore on his broad back the largest and heaviest foundation stones of Britain's commercial greatness. A humble Cornish churchyard holds his dust, and you would search in vain among cathedral niches to find a tribute to his memory, a blessing on his name. Yet we want no tablet to tell his fame. From the Cape to Cairo, from St. Petersburg to Vladivostock, in English lanes and crowded city streets, every locomotive that draws a train speaks to us of the two great men who gave them being—the ill-used Cugnot and forgotten Trevithick.

Dick Trevithick was, I think, about twenty-five when he made his first model of a locomotive. And four years later he was building his first life-size steam-carriage—the first "motor-car" ever seen in England. It was on Christmas Eve, 1801, that the first trial was made. An eyewitness said: "When we seed Cap'n Dick was a-going to turn on steam, we jumped up, as many as could, maybe seven or eight of us. 'Twas a stiffish hill going from the Weith up to Camborne Beacon, but she went off like a bird."

Four days later the engine was tried again, but it came to an untimely end. Trevithick and his companions went into an inn for refreshment and ran the engine—which doubtless attracted a considerable crowd of yokels—into a shed. But while they were enjoying the Christmas fare that the inn provided—I remember that roast goose is reputed to have been the *pièce de résistance*—the shed caught fire, and the first self-propelled carriage was destroyed.

To give you some idea of what the engine looked like, let me say that it looked for all the world like the tar boiler you may see when the roads are being tarred or asphalt pavements laid—a cylindrical boiler on four wheels, with a long chimney sticking out of one end of it.

Not many months after the first road engine had come

to grief, Trevithick took out a patent for a much more elaborate steam-driven coach. He was joined in this enterprise by his cousin, Andrew Vivian. This coach was built, and proved to be a great success.

I shall not trouble you with a description of it; but it must have been a wonderful thing to behold, if we may judge from an old picture of it. It puffed and clattered along the roads about Cambourne "faster"—so we are told—"than a man could walk", and created, we may be sure, a great deal of stir on its journeys.

After a time, Trevithick and his cousin decided to put the coach through its paces in London; so to London it was taken, and people had rides on it, and said it was a very fine thing, withal rather terrifying. The trouble was that nobody wanted to buy it, or to commission its inventor to build others. Besides, by this time Trevithick had grown tired of his toy, and had turned his attention to other outlets for his exuberant talents, so he built a railway locomotive—the first in the world—and a steam dredger, also the first in the world.

In the year 1831, when the volatile inventor of the first practical steam-carriage was within two years of his death, the House of Commons, in its wisdom, appointed a Select Committee to inquire into the use of self-propelled vehicles on the common roads. In the year 1831, the House of Commons, in its folly, failed to act upon the recommendations of its chosen guides. Had the legislature as a whole been as clear-sighted as the gentlemen who formed the Committee, England would have led the world in motor construction and in inland communication. Prejudice, narrow-mindedness, and self-interest, however, proved strong enough to sway the law-makers, and the industry received such a set-back that even now it has not entirely recovered the lost ground.

We have lost nearly a hundred years! That is the melancholy conclusion to which we are forced when look-

ing into the history of transport by mechanically-driven vehicles. For we have seen that horseless vehicles were in existence long before the faithful Commons gave them their attention; and with a feeling of shame we have to own that in the early part of the twentieth century we stand very much where we ought to have stood before the nineteenth century had advanced very far upon its way.

It must, of course, be admitted that the motor-car as we know it to-day has developed largely since the invention of the internal-combustion engine; but who is to say that the discovery would not have been made sooner, had not all enterprise been strangled by the attitude of the country to the early experimenters? With the removal of the terrible handicap under which the motor industry had laboured, the genius of man became active; and in less than twenty years from the " Motor's Emancipation " we have advanced far on the road from crudeness to perfection. The motor-driven vehicle in use at the close of the nineteenth century was a primitive, an unreliable, and often a treacherous thing; the car of to-day can be depended upon to go where it is wanted, to travel quickly, and to reach its destination almost with the punctuality of a royal train.

Much of this progress might have been—indeed, it ought to have been—reported many, many years ago, and England might have set the fashion for the world. In the early part of the nineteenth century inventors were busy, with the result that in the " 'thirties " about a dozen companies were running steam passenger coaches in various parts of the country.

One of the most weird-looking objects on the highway in those days was William Church's steam coach. Its wheels —a single steering-wheel in front, a single one behind, and a pair in the centre—were almost invisible from the road. They were boxed in by elaborately-decorated and gaudily-coloured panels, which gave the coach the appearance of a

glorified circus car. It had accommodation for passengers and luggage in two compartments, and there were garden seats for about twenty persons on the roof, while four privileged travellers occupied a canopied box seat over the steering-wheel. This gilded monster took the road between London and Birmingham.

It may well be asked, with so promising a start eighty years ago, how was it that the motor industry so completely disappeared from England between 1840 and 1896? The answer is to be found largely in the prohibitive tolls which were levied on mechanically-propelled vehicles, and in the vexatious legislation passed at the instigation of those who were short-sighted enough to imagine that their interests were threatened by this new form of locomotion. By 1840 the tolls had increased to such an exorbitant extent that the steam-coaches began to disappear from the road. All the profits were eaten up by road charges, and the pioneers, who had other ends in view besides progress and the gaining of fame, gave up the struggle against overwhelming odds. So progressive England dammed the tide of progress, checked the enthusiasm of her ingenious sons, and killed in its infancy an industry from which she might have gained wealth and strength.

After the steam-coaches had finally been withdrawn the traction engine made its appearance on the roads, and began to draw heavy loads about the country. They were, of course, too ponderous and slow to be used for passenger traffic, and they were used entirely for transporting heavy material. But the legislature, goaded by those who looked askance at the travelling monsters, came to the conclusion that a curb must be put upon this form of traffic. Accordingly in 1865 the famous "red flag" Act came into being. This really amazing law enacted that the number of persons required to drive road locomotives should be increased to three; that the maximum limit of speed should be reduced to four miles an hour; that a man should

precede each locomotive with a red flag at a distance of a hundred yards; and that drivers should be forbidden to allow the engines to blow off steam in the streets. The result of this Act was to sound the death-knell to all motor traffic excepting that of the heaviest kind.

A few men, greatly daring, continued to make experi-



One of the First Motor-cars—the Man with the "Red Flag"

ments, but their trial runs had to be made under cover of night, and like many other men who follow an illegal pursuit in the hours of darkness, they often had to pay the penalty in the police court on the following morning.

Relief came at last with the passing of the Motor-car Act of 1896, which allowed mechanically-propelled vehicles to proceed along the road at a speed not exceeding 14 miles an hour. 14th November, 1896, was the day on which the repeal of the "red flag" Act became effective, and to celebrate so great an occasion an inaugural run from London to Brighton was held. The story of that run, with its numerous mishaps and break-downs, makes amusing reading now that, with more than twenty years' experience

behind us, we can place almost as much reliance on a motor-car as we do on the railway.

It is not with the story of the run in general, however, that we can deal here, but with the fate of one particular car, for in this we see the first of the new-style road transporters.

The first transport car in the first London-Brighton run is dealt with by Mr. Jarrott in the following paragraphs, borrowed from the pages of his book:—

"A parcels van was also in evidence, although I do not suppose it ever carried a parcel in its existence, and it certainly looked as if it would collapse forthwith if something larger than a hatbox was placed upon it.

"The van was, as a matter of fact, fitted up as a 'breakdown' van (save the mark!). It contained many things which, in the opinion of the experts, might be required by the various cars on the road, and it was supposed to bring up the rear of the procession to aid any of the cars which were stranded. There was no question about it being in the rear of the procession; it was incapable of being anywhere else. Charles Rush, who was driving, explained to me that he arrived in Brighton on the following morning at 3 o'clock, having spent the best part of his time beneath his car repairing break-downs on the 'break-down car'."

The Heavy Motor-cars Order came into operation early in 1905 and increased the maximum unloaded weight of wagons to 5 tons and the gross weight (loaded) to 12 tons. The combined weight of a motor and trailer (loaded) was fixed at a maximum of 20 tons.

Remarkable indeed has been the progress of the commercial car since the adoption of the 1904 Order. Now it may safely be said that there is a car for every purpose. No trader with a business of any dimensions can afford to ignore the motor if he wishes to keep abreast of the times and to maintain his position in these days of strenuous competition. This fact has been recognized by even so humble

a worker as an up-to-date chimney-sweep in the provinces, who goes upon his daily round, armed with his brushes and his sticks, in a little cycle-car driven by a petrol motor.

For the small shopkeeper there is the tri-car, which can be purchased for about a hundred pounds. By the aid of this trusty little servant, the provision dealer, the draper, and the numerous others who reap a harvest from the daily needs of man and woman can distribute their goods over a far larger circle and ensure earlier delivery than was possible in the days when they had to rely on the foot messenger or the pony cart. For the stores, for the carriers, and for the laundries there are petrol-driven vans of all powers and sizes, ready to run over all manner of roads and to bring in trade which fifteen years ago would have been lost because it was unreachable. For the contractor, for the furniture-remover, and for the railway and all who handle heavy weights, there are petrol- or steam-driven lorries and wagons, and steam tractors or miniature traction engines.

All over the country, from Land's End to John o' Groats, from the east coast even to the west, the motor-cars, wagons, lorries, and tractors are speeding over the roads, bringing the most isolated villages into touch with the towns, finding new markets for merchandise, bringing profits to their owners and no small degree of benefit to those whom they serve.

It has been written earlier in this chapter that where heavy road traffic is concerned steam continues to hold its own. Traction engines have been improved out of all recognition; the little tractors have been developed almost to perfection, and the steam-lorry, manufactured by some of the leading British engineering firms, is finding more and more users as the years go by. The motor-lorry is perhaps the most popular of them all. In their early days these steam-lorries differed considerably from each other, but gradually they conformed more or less to a uniform pattern—a design with which we must all be familiar.

The majority of these vehicles carry the boiler and engine in front and below the framework, in order to leave the maximum of space for the carrying of goods.

The Commercial Motor Users' Association has done much to foster the use of mechanically-propelled vehicles in England generally and in London in particular. One important step taken by the association was the organization of a scheme to encourage drivers to take a personal interest in the driving and condition of their vehicles, and to run them without accident. The efficiency of the driver is naturally an important factor in the successful use of the motor for commercial purposes, for an inefficient or careless man at the wheel may add so greatly to the cost of the vehicle's upkeep as to make the charge prohibitive to a business concern.

As the direct outcome of this idea, the Whitsun Monday Parade of Commercial Vehicles in London came into being in 1907. At the first parade there were 26 entries; at the seventh parade (12th May, 1913) 380 vehicles lined up in Grosvenor Road. One of the successful drivers at this Whitsun Monday Parade recalled his early experience with motor vehicles. In the year 1900 he drove a motor-wagon from London to Sevenoaks, a distance of 17 miles. He started at 7 a.m. and arrived at his destination at 8 p.m. —17 miles in thirteen hours! On the way they lost steam, and when they got steam they lost coal. At 5 o'clock the next morning they had to raid a farm and help themselves to hop poles to heat the water before they could proceed. Another driver returned without his gauge glass, but he did not mind, because, as he said, if the motor was working he knew there was steam!

Since 1904 motor-omnibuses and motor-cabs or taxis have become common in the larger towns, and the pleasure car is to be seen in almost every corner of the earth.

England's first opportunity of using the motor in war occurred during the Boer War, which clouded the close of

the Victorian era. Since that time the development of the motor has made such rapid strides that in the recent European War it was used by all the belligerents, and in England the Mechanical Transport Department of the War Office was formed to devote itself to the whole problem of mechanical transport.

One more aspect of the motor's use in transport must be mentioned before this chapter is ended. Over this there hangs the shadow of a great tragedy. Captain Scott, when making his preparations for his expedition for the discovery of the South Pole—the quest which was to succeed at the cost of his life and the lives of his four brave companions—had motor-sledges built to assist in the work of transporting the explorers' necessities over the Antarctic snows and ice. Marvels of man's genius were these sledges, and Captain Scott was hopeful that they would be of enormous assistance to him and his companions. At a trial held in Norway, before the expedition started, the sledges proved equal to accomplishing a speed of 5 miles an hour over the snow, while dragging a weight of about 1 ton.

Alas! the relentless South was not to be conquered by the motor at its first assault. True, the South Pole was discovered, but the motor seems to have played merely an inglorious part in the discovery. That the sledges were not a great success is patent. In the reports telegraphed from New Zealand, on the return of the *Terra Nova* with the tragic tidings, two references were made to the motor-sledges. The first reported that when Captain Scott began his advance to the south he dispatched two motor-sledges dragging fuel and fodder. It is related thut the rest of the party followed the tracks of the motors for 60 miles on the road to One Ton Camp (11 miles from which Scott died on the homeward journey), and then found the machines abandoned because of the overheating of the air-cooled engines. It seems a strange fate to have overtaken them in the Antarctic!

The view expressed in these telegraphed reports was fully borne out by Commander Evans, who succeeded Captain Scott as commander of the expedition. Commander Evans, in a lecture before the Royal Geographical Society on 21st May, 1913, when he told the full story of the voyage and its great tragedy, made two references to the motor-sledges. Relating the story of the landing at Cape Evans in January, 1911, he said: "Captain Scott, Wilson, and myself went across the ice and visited a little cape which looked and subsequently proved to be an ideal spot for wintering. This place Captain Scott named Cape Evans. Immediately the winter quarters were selected, out came the stores and transport. Lieutenant Pennel took charge of the ship and Lieutenant Campbell the transport over a mile and a half of sea ice. Mears's dogs, Oates's ponies, and Day's motors, supplemented by the man-hauling apparatus, passed between the ship and the shore transporting the stores over the frozen sea." At the beginning at any rate, the motors appear to have caused no trouble.

The trouble was to come on the final advance. This is Commander Evans's narrative of their last effort: "On 24th October (1911) the advance-guard of the southern party, consisting of Day, Lashley, Hooper, and myself, left winter quarters with two motor-sledges. We had with us three tons of stores carried on six sledges. The object of sending forward such a weight of provisions was to save the ponies' legs over the variable sea ice, which was in some places hummocky and in others too slippery to stand upon. The first thirty miles of the barrier was known to be bad travelling. The motor party had rather trying experiences owing to the frequent overheating of the air-cooled engines. Directly the engines became too hot they refused duty and we had to stop; and by the time they were reasonably cooled the carburettors had to be warmed up with a blow-lamp. Day and Lashley, the engineers, had great trouble in starting the motor-sledges. It is true

that the motors advanced necessaries for a southern journey 51 miles, but at the expense of the men who had charge of them. The engineers continually got their fingers frost-bitten tinkering with the engines and replacing the big-end brasses, which several times gave out. Although the temperatures were low we were all very happy, and Day was most keen to bring the motors through with credit. They were abandoned a mile south of Corner Camp; but they had advanced their weights in turn over rough, slippery, and crevassed ice and had thus given the ponies a chance to march light. The first thirty miles of barrier surface led over very deep soft snow, and in fairness to the despised motors they went better over the soft snow than any other part of our transport."

So the motor has been very nearly to the "ends of the earth", but it has yet to retrieve its character in Polar regions. That its first journey in so forbidding a land should not have been crowned with great success is no dishonour to the motor. It is not, after all, so very many years ago since numerous first efforts to reach Brighton from London were ignominious failures! Failures should at any rate be regarded as stepping-stones to success. The motor builder and the motorist have profited greatly by the early set-backs, and doubtless the lesson of the Antarctic will not be neglected when there is a call for more motor sledges. And meanwhile the self-propelled vehicle will proceed upon its triumphant way—a friend to the rich and to the poor; an aid to pleasure and an indispensable adjunct to commerce; useful in peace and formidable in war.

CHAPTER VI

Sea Transport in Ancient Times

So far we have dealt with overland transport only, but, as the geography books tell us, for every square mile of land surface the world has about 2½ square miles of water surface; and it is plain, therefore, that if we had to rely upon land transport only, our communications with other countries would be sadly restricted. As a matter of fact, water transport has been linked with land transport from the remotest historical times.

For all we know to the contrary, the distinction of building the first ship may be due to the dwellers upon the shores of the Atlantic, or the Indian, or the Pacific Oceans. All we can say is, that so far as the countries bordering upon the Mediterranean are concerned, everything seems to point to the Nile valley as the birth-place of naval architecture. " We know that the ancient Egyptians, at a period which most modern authorities place at about 7000 years ago, had already attained to a very remarkable degree of civilization and to a knowledge of the arts of construction on land which has never since been excelled. What is more natural than to suppose that the genius and science which enabled them to build the Pyramids and their vast temples and palaces, should also lead them to excel in the art of building ships?"

Fortunately for our knowledge of these wonderful people, they lived in a climate so dry that the pictures with which

they decorated their tombs and temples have remained almost as fresh as when they were painted or sculptured thousands of years ago. In many of the tombs, models as well as drawings of boats have been found, together with descriptive accounts of the uses to which they were put. They constitute, in fact, a sort of Illustrated Egyptian News which brings home to us across many tens of centuries the habits and customs of nations that have long since disappeared.

The earliest vessels of which any particulars have come down to us are supposed to have been built between 5000 and 6000 years before the Christian era by the people who inhabited Egypt before the coming of the builders of the Pyramids. Some of the representations of these early vessels are so rude that I do not think you would recognize them as boats. But for the birds which the artist has represented as flying over or resting upon them, you might take them at first glance for scrubbing-brushes. Recent discoveries of larger drawings of similar objects show, however, that the things which look like the bristles of scrubbing-brushes are intended for oars; and the fact that specimens of pottery from the eastern shores of the Adriatic were also discovered in the tombs in which these pictures were found, seems to prove that 7000 years ago boats were used, not only for river traffic, but for sea voyages of considerable length.

The Egyptians—that is to say, the people who inhabited Egypt after the builders of the boats just described—were either much better boatbuilders or much better artists than their predecessors, for their pictures of boats are not to be mistaken for anything else. The earliest known representation of an Egyptian boat is supposed to be about 6300 years old—that is to say, nearly 2000 years older than the date assigned to the building of Noah's Ark. This was a shapely vessel, something like a large gondola, propelled by paddles. The boat was wholly or

partly decked, so that the paddlers squatted on their haunches flush with the gunwale. At the bow stood a man with a sounding-pole, ready to give warning of shoal water or to shove the boat's head away from rocks; and at the stern stood three steersmen, with paddles rather larger than those used for propelling the boat. Amidships stood an officer with a formidable whip in his hand. This was the lever with which the marine engineer of those days was accustomed to put on more steam, and I am afraid that the ancient Egyptian equivalent for "an extra knot" had a very painful meaning for the seamen of the time.

The most interesting points about this boat, however, are, first, that it was apparently 50 or 60 feet long, and must therefore have been no mere dug-out, but a scientifically-built-up boat; and, secondly, that it carried a mast, thus proving some knowledge of sailing even at this early date. The mast is a triangle, being shaped like the letter A, with a wooden cross-piece in the middle. The sail, as appears from other drawings, was a square sail set upon a yard, the braces of which were held by a man sitting in the stern of the boat. Herodotus tells us that in his time (450 B.C.) the sails of the Egyptian Nile boats were made of papyrus—rather a curious fact, considering that the Egyptians not only manufactured linen, but actually exported it to other Mediterranean countries for use as sailcloth. The same historian describes how the boats were steered down-stream with a stone dragging astern upon the bottom of the river. You may see this method practised nowadays in our English estuaries when there is no wind, by fishermen who have never heard of Herodotus; only, instead of a stone they use a kedge or anchor, towing it in such a way that its crown just touches the bottom. Their object, like that of the ancient Egyptian navigators, is to prevent the boat from drifting at the same rate as the stream, for if it did so it would not steer.

Enormous blocks of granite were conveyed by water

from the quarries at Assouan for the building of pyramids and temples. In the Temple of Der-el-Bahari has been found an illustrated account of the shipment of two obelisks which are supposed to have weighed together about 700 tons, and the sculptured pictures show that the barges designed for their transport were stayed and trussed with beams in a thoroughly scientific manner.

Coming to ocean as distinct from inland transport, the earliest oversea expedition recorded in the world's history took place about the time assigned to the building of Noah's Ark (2400 B.C.). It was an expedition from Egypt to the land of Punt, supposed to be the country known now as Somaliland, and its object was " to fetch for Pharaoh sweet-smelling spices ". The enterprise was under the command of an officer named Hannu, whose account of it has been translated from the original hieroglyphics and published by Dr. Henry Brugsch.[1] After describing his preparations, Hannu says:

" I arrived at the port Seba, and I had ships of burthen built to bring back products of all kinds. And I offered a great sacrifice of oxen, cows, and goats. And when I returned I had executed the king's command, for I brought him back all kinds of products which I had met with in the parts of the Holy Land (Punt)."

We have a fuller account of another voyage to Punt which took place about 1600 B.C., at the time when the Israelites were in captivity in Egypt.

" The ships were laden to the uttermost with the wonderful products of the land of Punt, and with the different precious woods of the divine land, and with heaps of the resin of incense, with fresh incense trees, with ebony, (objects) of ivory set in pure gold from the land of Amu, with sweet woods, Khesit wood, with Ahem incense, holy resin, and paint for the eyes, with dog-headed apes, with long-tailed monkeys and greyhounds, with leopard skins,

[1] *History of Egypt under the Pharaohs.*

and with natives of the country together with their children."

The historian concludes by asserting that the like had never been done before. Hannu had made the same boast about eight hundred years earlier. It seems to have been regarded as the proper way of polishing off every story of Egyptian enterprise.

The ships used at the time of this great Punt expedition were very much larger and more powerful than the river boat with paddlers previously described. They were propelled in calms and adverse winds by fifteen pairs of oars, and they carried very large square-sails with yards both at head and foot, so slung from the mast that they could be braced at any angle. The sailing capabilities of these vessels, therefore, were not limited to running dead before the wind; yet they could not have sailed very much off it without drifting rapidly to leeward, owing to the absence of keels or leeboards. They had very long overhangs fore and aft, and their form, as well as the great size of their steering-paddles, suggests that the two helmsmen must have had all their work cut out for them to keep a straight course when running before a stiff breeze.

A few hundred years after the second Punt expedition two other maritime nations appear upon the misty horizon of history. We come to the Homeric Age, when Hellas

> "launched a thousand ships
> And burnt the topless towers of Ilium".

These ships, as described in Homer, were undecked vessels large enough to carry 120 warriors, but light enough to be drawn up on land. They were propelled chiefly by rowers who sat on benches, but they carried a mast and square-sail.

About this time a very remarkable position in the commerce of the world was occupied by the Phœnicians, who inhabited a narrow strip of country on the coast of Palestine. They are supposed to have come to the Mediterranean

from the shores of the Persian Gulf, but whatever their origin, they showed an extraordinary aptitude for trade and navigation. Their chief ports were Tyre and Sidon, and in these cities the overland commerce of the East met the seaborne commerce of the West. In *Ezekiel* there is a denunciation of Tyre which gives us a wonderfully vivid picture of the extent and value of Phœnician trade:

"O thou that art situate at the entry of the sea, which art a merchant of the people for many isles. . . . O Tyrus, thou hast said I am of perfect beauty. Thy borders are in the midst of the seas, thy builders have perfected thy beauty. They have made all thy ship boards of fir trees of Senir: they have taken cedars from Lebanon to make masts for thee. Of the oaks of Bashan have they made thine oars; the company of the Ashurites have made thy benches of ivory, brought out of the isles of Chittim. Fine linen with broidered work from Egypt was that which thou spreadest forth to be thy sail. . . . The inhabitants of Zidon and Arvad were thy mariners; thy wise men, O Tyrus, that were in thee, were thy pilots. The ancients of Gebal and the wise men thereof were in thee thy calkers; all the ships of the sea with their mariners were in thee to occupy thy merchandise."

The Phœnicians in Ezekiel's day sailed far and wide across the seas. They traded with Cyprus and Rhodes, with Greece, Italy, and the northern shores of Africa, where they founded the colony of Carthage, and with Spain, where they founded Cadiz. They traded, indeed, with every part of the world that was known to them and to their neighbours, and to at least one part that was known only to themselves; for some of their adventurous captains, sailing over stormy seas far beyond the Pillars of Hercules,[1] discovered a northern country where the valuable metal, tin, was to be obtained. The Phœnicians kept its whereabouts a secret, and refused to allow the vessels of other nations to sail in company with

[1] i.e. the Straits of Gibraltar.

theirs, lest they too should discover the mineral wealth of Britain.

The Phœnicians not only traded on their own account; they lent ships and seamen to other nations. There is some reason for believing that in the service of King Solomon they sailed as far east as India. Herodotus tells us that about the year 600 B.C. they circumnavigated the African continent. He tells us that Neco, the reigning Pharaoh of Egypt, began to cut a canal through the Isthmus of Suez, but, finding the task too great, abandoned it. He was convinced, however, that the continent, except for the isthmus, was surrounded by sea, and to prove it he engaged some Phœnicians to sail round from the Red Sea to the Mediterranean. The voyagers proceeded in a very leisurely way, sailing only in the summer-time. When autumn came, they went ashore, sowed wheat, and made themselves as comfortable as they could until it ripened. Then they loaded the grain into the ships and sailed on until it was time to sow another crop. In this way they took more than two years to sail round the Cape into the Mediterranean, but it was a very remarkable accomplishment nevertheless. "They told me," says Herodotus, "what I for my part cannot believe, that when they were sailing round they had the sun on their right hand." What the old historian could not believe is really the best evidence that his tale is true, for south of the Equator, as you know, one sees the sun to the north, and it rises therefore on the right hand of the observer instead of on the left, as in our northern latitudes.

There was a marked difference, even in the days of the Phœnicians, between the war-ships and the merchant ships. While the war-ships of the Mediterranean until the sixteenth century of our era were galleys propelled mainly by oars, the merchantmen were built for sailing, and were broader and deeper than the galleys. The sail was carried on a yard as long as or longer than the vessel's deck, and at

the top of the mast there was a cup-shaped crow's-nest for the look-out man. The steering was effected by two large oars, resting on notches in the gunwale and secured by a thong, or, in larger vessels, working through stern ports which could be used as hawse-holes when the steering-oars were unshipped.

It was doubtless in such ships as these that the Carthaginians, who succeeded the Phœnicians of Tyre as the masters of the sea, traded with Gaul, Britain, the Canaries, and Guinea. About the year 500 B.C., Hanno the Carthaginian undertook a colonizing expedition to the West Coast of Africa with sixty ships. We have a full description of his adventures, including the discovery of "a savage people with hairy bodies, whom the interpreters called gorillas".

It was from Carthage that the Romans learnt most of what they knew about shipbuilding and navigation, and after the destruction of that city there was no marked alteration in Mediterranean ships for many centuries. The vessels were sometimes of considerable size, and were capable of keeping the sea in severe weather; but they seldom sailed abroad in winter, chiefly perhaps for the reason that they were steered by the stars, and that clear skies were therefore necessary for safe navigation.

At the opening of the Christian era the arts of shipbuilding and navigation, which, as we know, had been progressing for many centuries previously, had attained a high degree of development in the Mediterranean. Now let us turn to the north, and see what the inhabitants of Britain had been doing in this direction. Eight years before St. Paul was shipwrecked at Malta, Julius Cæsar had crossed from Gaul to Britain, and had lifted the veil which up to that time had shrouded from the civilized world of Rome the habits and customs of these distant islanders. According to Cæsar, the British boats were mere coracles of wicker-work covered with skins, and the British seamen,

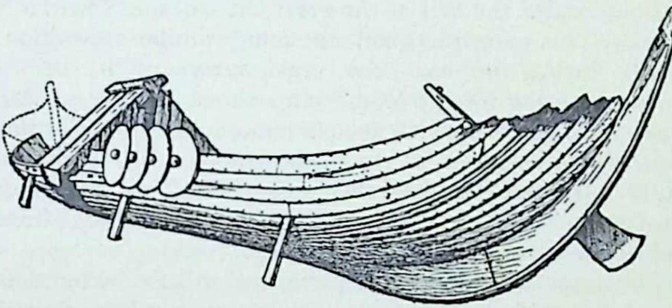
if seamen they can be called, never tasted food upon a voyage—proof that their longest voyages could not have extended over many hours.

Before the Roman invasion British commerce was a thing almost unknown. The Romans gave a different aspect to the scene. Their legionaries sighed for the comforts of civilization. They connected their island camps with the coast by excellent roads. They made harbours and lighthouses, and for the next 300 years or so the Roman ships sailed into Dover, and up the Thames to London, bringing the good things of Italy and Gaul, and taking back with them the natural products of Britain.

In course of time, Rome, hard pressed elsewhere, withdrew her legions, and left the shores and shipping of Britain to the tender mercies of the Saxon corsair " whose pastime it is " (says a contemporary historian) " to plough the British Sea in a boat made of skins and stitched together ". After their conquest of England they seem, however, to have neglected the maritime arts, and to have suffered the ravages of the Danes or Northmen without any effective resistance until the great King Alfred's time.

These Northmen were called Vikings, a word which means sons of the Fiord, because they came from the creeks of Norway and Denmark. They were very brave and very cruel, and they were just as much at home upon the sea as upon the land. If all the tales told of them are true they must have been acrobats as well as sailors, for it is related of one of them that he could run along the oars as they were flashing in the water, and could perform the juggler's trick of keeping three javelins in the air at the same time, throwing them as high as the masthead and catching them as they fell. We know exactly what their boats were like, because when a great Viking died his boat was buried with him, and some of these boats have been dug up in recent times and placed in museums. They were propelled mainly by oars, but they carried also a mast and square-sail. The

boats were models of lightness and strength, well suited for the swift and sudden raids which made the name of the Northmen so greatly feared. They do not seem to have been so well fitted for long voyages, but we know that their terrible owners overran at one time or another the whole of the European seaboard. They found their way into the Mediterranean, they discovered and colonized Iceland, and there is some reason to believe that they discovered America 500 years before Columbus. The Northmen had things



Remains of a Viking Ship found in Norway

nearly all their own way until King Alfred built bigger and better vessels than theirs, and thus laid the foundations of a British navy.

If every Saxon king who followed Alfred had given as much thought to the navy as he did, there would have been no Norman invasion, and William I would have failed to earn his title of the Conqueror. Harold had ships, indeed, but did not use them, and William was so little afraid of them that he brought his army across the Channel in an unprotected fleet of about 1000 small vessels, which he burnt as soon as he had landed in Sussex. A hundred ships manned by the seamen of Alfred's day might have sent the would-be conqueror and half his knights to the bottom; but whether that would have been a good thing for

you and me and for England is a question which is rather too difficult to answer.

But now, having seen William and his knights across the English Channel, we must glance again at the Mediterranean, whose Powers are still competing for the commerce of the inland sea. Chief of them is Venice, "the Queen of the Adriatic", which at the time I am speaking of, and for long afterwards, was the greatest maritime power in Europe. Thirty years after the Norman Conquest Godfrey of Bouillon led the first of the great Crusades into the Holy Land. This expedition, and the many similar expeditions which during the next 200 years succeeded it, helped greatly to bring Venice to the pinnacle of her naval fame; for she and her sister States alone among European Powers had ships enough to transport the troops and horses and stores to the battle-fields of the Cross. The Crusaders made the fortunes of the shipowners and merchants of Venice and of the rival republic of Genoa.

The English ships at this period were little better than open boats with a single mast. It was not until the time of Richard III that English seaborne trade obtained a firm footing in the Mediterranean, and that English vessels attained anything like the form which we are accustomed to regard as "shipshape". Meanwhile it was left, as we shall see in the next chapter, to the adventurous seamen of other nations to discover new worlds and new openings for trade.

CHAPTER VII

The Discovery of the World's Sea Roads

If you turn to the map of Europe in your atlas, you will probably find that the draughtsman has included within its borders the southern and eastern shores of the Mediterranean—which, as you know, are not in Europe—and also a small piece of Greenland. With these inclusions the map roughly represents as much of the world as was known to European navigators at the beginning of the reign of Henry VII—that is, about 430 years ago. Geographers and merchants knew that far to the east of Europe were India and Cathay (China), whence came gold and silks and spices and precious stones; a few—a very few—European travellers—among them the Venetian, Marco Polo—had visited these distant countries; but the trade and the travellers passed overland through Egypt to the Red Sea, or through Syria to the Persian Gulf. No European ships had repeated the feat, said to have been accomplished by Phœnician sailors 2000 years earlier, of doubling the African Cape, or that attributed to the Norsemen, of crossing the Atlantic. A few Portuguese adventurers had begun to explore the West Coast of Africa, but had not yet ventured as far as the Equator. The southern extent of the African continent was an unsolved riddle; the existence of the great transatlantic continent was undreamt of.

You see how small was the seaman's world in the middle

of the fifteenth century. Its smallness is the more surprising because for a hundred years or so European navigators had carried in their ships two things which must have greatly increased their confidence. One of these things was the compass, which enabled them to steer without the stars; the other was gunpowder, which gave them security against the attacks of any hostile savages upon whose shores they might land. Nevertheless there seems to have been at this time little inclination for maritime exploration except in Portugal, where Prince Henry the Navigator opened the glorious age of discovery associated with the names of da Gama, Columbus, and Magellan. When Prince Henry died, in 1460, the limits of the world as known to European navigators were, as I have already said, about the same as those of the map of Europe in your atlas. Twenty-six years later Diaz had doubled the Cape; in another six years Columbus had discovered America; six years later still, Vasco da Gama had sailed to India; and in twenty-two years more, one of Magellan's ships had completed the circumnavigation of the globe. In less than a hundred years after Prince Henry's death, almost all the world, as we know it now, had been outlined by explorers, and the merchant ships of Europe had sailed in all its seas.

What was the lodestone that drew the early explorers east and west and round the globe? The answer is to be found in the trade of the East Indies, and in the growth of the conviction that the overland route was not the only one by which that trade could be conducted. From the days of Solomon, as we have seen, spices and silks had come from the East by way of Syria and Persia, but at the time of which we are now speaking this route had fallen into the hands of the Moors, and the trade was carried on with increasing difficulty.

Prince Henry the Navigator was bold enough to think that there might be another way, and he became at last so confident of finding one that he asked and obtained from

the Pope a grant to Portugal of all the countries that he might discover by sailing south and east. Summer after summer he sent forth the ablest and the boldest captains he could find, while he busied himself in improving the building of ships and the training of seamen, and in collecting maps and scientific observations. Every year his ships ventured a little farther, and before Prince Henry died the Portuguese had become the leading maritime nation of the world.

In 1486, when John II was King of Portugal, interest in the discovery of a sea route to the Indies was revived by a strange story which came from Africa. Some natives of Benin had told the Portuguese traders that far in the interior there reigned a great Christian king. Now from the time of the Crusades it had been widely believed in Europe that somewhere in the East there was a wonderful country ruled by a Christian monarch called Prester John, or John the Priest. The Christian king spoken of by the Benin natives was said to reign in Africa; Prester John, according to all accounts, reigned in Asia; but who could say where Africa ended and Asia began? Might not the Christian kingdom of the African stories be the same as the Christian kingdom of the Asiatic stories? The king, as his historian tells us, "considering that all spices, drugs, precious stones and other riches, which came from Venice, were brought from the East, and being a prince of great penetration and enterprise, desired to enlarge his kingdom and to spread the knowledge of the Christian faith to distant regions. He resolved, therefore, to discover the way by sea to the country from which such great riches came. He was greatly encouraged to this enterprise by learning that there were Christians in India, ruled by a great monarch called Prester John, to whom he wished to send ambassadors that friendship might be established between the two kingdoms."

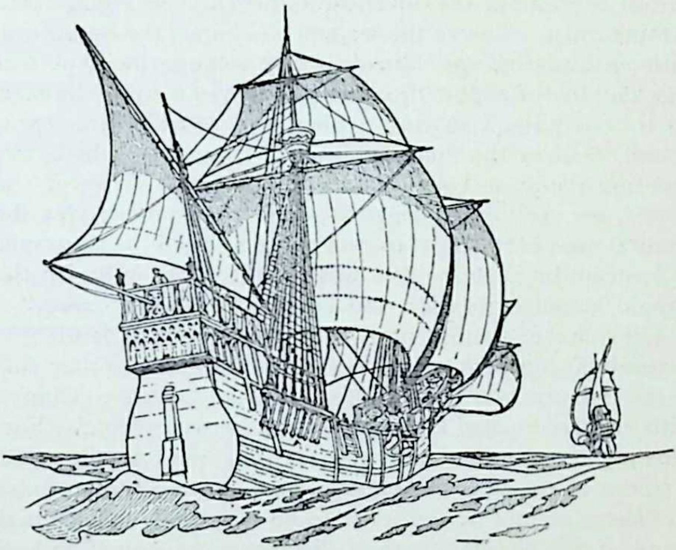
King John accordingly fitted out three little ships—the

largest was only 50 tons burden—and placed them under the command of Bartholomew Diaz. Diaz sailed down the West African coast as far as Angra Pequena. A northerly gale springing up, the little ships were blown due south, out of sight of land for thirteen days; and when they came to land once more, Diaz found that he had reached the south coast of Africa. Here his provisions began to fail, and his men prevailed upon him to return. So reluctantly he turned homewards, discovering on his way the Cape—not the most southerly, but the most prominent of the southern points of Africa. He called it the Cape of Storms. King John gave it a better name—the name by which we know it now—the Cape of Good Hope.

Among the seamen who sailed with Diaz to the Cape was a Genoese Italian named Bartholomew Columbus, whose younger brother Christopher was destined soon to achieve the greatest geographical discovery that ever was or ever can be made. Unlike his predecessors, who had sailed along known coasts to discover what lay beyond, Christopher Columbus boldly left the land behind him with the conviction that he would find another land across the ocean, and he found it at the first attempt. The great merit of his discovery was that it was no mere accident, but the triumphant justification of a belief based upon scientific knowledge. If, argued Columbus, the world is round, then India may be reached by sailing to the west. With this conviction he appealed to his own country, Genoa, to Portugal, and to England, to provide the means for an expedition.

His offer was not, however, immediately accepted, and he turned to Spain. Here for a long time he urged his project in vain. All the learned men of Spain were against it. If, they said, in so many thousand years no land had been found to the westward, it was not likely to be found now or ever. The ocean was so vast that no ships could sail across it; and if any ship tried to do so, the curvature

of the globe would make it impossible for her to climb back again, even with a gale of wind behind her. Such were the arguments which poor Columbus had to answer, but he never lost heart. At last his perseverance was re-



Ships of Columbus crossing the Atlantic

warded. He gained the ear of Isabella of Castile, and she and her husband King Ferdinand agreed to provide him with the ships he wanted. The fleet consisted of three vessels: the *Santa Maria*, commanded by Columbus, who was granted the title of Admiral; and two smaller caravels, the *Pinta* and the *Nina*, commanded by the brothers Martin and Vicente Pinzon. The crews numbered about 100 men, and the ships were provisioned for a year.

On 3rd August, 1492, the little fleet set out from Palos, a port on the southern coast of Spain, and steered south-west for the Canaries. On the second day out, the *Pinta's*

rudder broke. In consequence of this accident and unfavourable winds they did not reach the Canaries until 12th August. Here nearly a month was spent in providing a new rudder for the *Pinta* and a new rig for the *Nina*, and on 6th September the adventurers began their voyage into the unknown. Few of the seamen had joined the expedition with enthusiasm, and already every strange incident was regarded by the superstitious as an omen of coming disaster. As they left the Canaries, a plain and terrible omen presented itself in the volcanic Peak of Teneriffe, which was shooting flame and smoke into the sky. " Many of the men ", we are told, " began to weep and lament; but the admiral used every effort to comfort them with the assurance of soon finding the land he was in search of, and with the hope of acquiring wealth and honour by the discovery."

They were sailing now due west. What land was Columbus in search of? He supposed that the other side of the Atlantic was bordered by India and Cathay (China), with an island called Cipango (Japan) between them. Fortunately he supposed the world to be much smaller than it is, but he meant to sail on until he found the Indian coast; and lest it should be farther than he supposed, and his men should grow alarmed at their distance from home, he kept two logs, one in which the real distance sailed each day was entered for his own guidance, the other in which a smaller distance was set down to mislead the timorous crew.

For eleven days they sailed over a calm sea with a fair wind, but the superstitious Spaniards found cause for anxiety even in the fine weather. It was a device of Satan, they said, to lure them on to destruction. What if the wind in these seas always blew from the east? How then would they ever be able to get home again!

On 18th September Martin Pinzon, in the *Pinta*, reported that he had seen land, but Columbus felt sure that he was mistaken, and would not alter his course. On the 22nd the wind changed to the west, and although the change was

unfavourable for his main object Columbus welcomed it, because he hoped it would satisfy the sailors that they would be able some day to sail back to Spain. It did not, however, stop them from grumbling. Some of them even suggested that they should throw him into the sea, and return to Spain with the story that he had fallen overboard while gazing at the stars. Columbus knew of their discontent, and did his best, both by threats and by promises of reward, to keep them quiet; but he must have had a hard time of it.

On 7th October their spirits were somewhat revived by signs that land was not far distant. Field birds flew over their heads, and land weeds were seen floating in the water. But, as the hours passed and no land came in sight, the men grew desperate; and the admiral, we are told, "could not long have resisted the increasing clamour if it had not pleased God, on the afternoon of Thursday, 11th October, to show such manifest tokens of land that all began to take heart". A green rush floated past, and a cane curiously carved, and a branch newly broken from a tree. Pointing to these signs, Columbus bade his men give thanks to God for His great mercies, and told them that he expected to discover land before the next morning. At ten o'clock that night, as the admiral sat watching upon the poop, he thought he saw a light. The light was seen by others and more than once, and at two o'clock in the morning a gun from the *Pinta* gave the joyful signal that land was undoubtedly in sight. The little fleet was hove to, and waited impatiently for the dawn.

Daylight revealed an island, well wooded, and inhabited by people who crowded naked on the beach to welcome the voyagers, who they supposed had come from Heaven. In their grandest clothes, and carrying the royal standard of Ferdinand and Isabella, the admiral and his captains rowed ashore. Their first act, on landing, was to kneel down to thank God for having preserved them to make

this great discovery. Then the seamen crowded round Columbus to express their sorrow for the mutinous spirit they had shown during the latter part of the voyage. He freely forgave them, and having formally taken possession of the island, he named it San Salvador—the name which it bears to-day. The natives were friendly, but Columbus did not stay long. Sailing farther west he discovered Cuba, San Domingo, and others of the West Indian islands, and then a succession of misfortunes compelled him to turn homewards. Taking with him six of the West Indian natives, and specimens of the products of their countries, Columbus began his return voyage on 4th January, 1493, and after some perilous adventures arrived at Palos on 15th March. From Palos the voyagers went by land to Barcelona, to be received by Ferdinand and Isabella. The journey was a triumphal progress, culminating in the welcome at Barcelona, where the simple seaman was received by the King and Queen with all the honours reserved for for a great noble.

Thus ended the voyage which must be regarded as the most remarkable in the history of discovery. The *Santa Maria*, the largest of the three vessels, was only about as big as a Thames barge. She was 128 feet long and 26 feet broad, and had an overhanging forecastle and an enormous poop.

Strictly speaking, Columbus was the discoverer, not of America, but of the West Indies. He did not land upon the American continent until his third voyage in 1498. The first European to see, if not to set foot upon, that continent was John Cabot, the leader of an English expedition, who, sailing from Bristol in 1497, landed at Cape Breton, and coasted round the Gulf of St. Lawrence. Neither Columbus nor Cabot was aware that he had found a new world. Each of them thought that he had reached the Indian seas. Columbus believed that Cuba was Japan—the Cipango of Marco Polo. Cabot believed that Cape

Breton was in the territory of the Grand Cham of Tartary, and that a passage to Cipango would be found to the south of it. The maritime nations, you must remember, were working for the same goal, namely India, where they thought all the precious things of the world came from. Spain and Portugal hoped to be the first to find the Indies, and to become the richest countries in Europe. Poor England, you see, was left out of account; but she had to be reckoned with later on: and in the meantime King Henry VII gave to John Cabot, who, like Columbus, was of Genoese origin, a patent authorizing him to sail from Bristol into all seas, to seek out in any part of the undiscovered world islands and countries hitherto unknown, to affix the banners of England in all places so found, and to subdue and occupy them for the English Crown.

Thus there were three eager competitors in the race for discovery, two of them working to the west and one to the east. In July, 1497, just as John Cabot was sailing into Bristol on his return from North America, a Portuguese squadron set out from Lisbon in the hope of reaching India by way of the Cape of Good Hope. The squadron was commanded by Vasco da Gama, and consisted of three ships, very much like the *Santa Maria* of Columbus, but somewhat larger. They rounded the Cape, discovered eleven years earlier by Diaz, and at length sighted the Indian peninsula, and cast anchor at Calicut. The importance of this discovery of a sea route to India was greatly increased by the fact that about the time it was made the Sultans of Egypt completely cut off the trade which had been carried on for thousands of years between India and the Mediterranean by way of the Red Sea. The Cape route became the highway to the East, and remained so until the last century, when the reopening of the overland route, followed in a few years by the cutting of the Suez Canal, restored commerce to its ancient course.

Vasco da Gama's discovery by no means checked the efforts of the explorers who hoped to reach India by sailing westward. As the years passed, and the Spaniards explored the Atlantic coast of America without finding any similarity between the native peoples of the country and those of India, the conviction was gradually forced upon them that the world was greater than they had supposed, and that between the West Indies and the East Indies lay a vast continent, and probably, for so the natives said, a vast sea.

At length, in 1513, the eastern shores of this sea were discovered by an adventurer named Vasco Nunez, who had fled from Spain to America to escape his creditors, and had appointed himself governor of the little Spanish colony of Darien on the Isthmus of Panama. A neighbouring chief perceiving the Spaniards' love of gold, asked them why they did not go to the place where it was found in plenty. Over the mountains was a great sea, bearing ships manned by dark-skinned seamen, and beyond the sea was a country where people ate and drank from gold. Delighted with this news, Vasco hastened back to Darien, where he soon organized an expedition of 190 Spaniards, armed with swords, shields, crossbows, and arquebuses. He embarked this force in a brigantine and nine canoes, and sailed westward along the shore of the isthmus to the territory of a friendly chief who had promised him guides. Then the adventurers struck inland towards the distant mountains, and arrived, on 26th September, at the foot of a peak from the summit of which, the guides said, the sea was visible.

Ordering his companions to stay where they were, Vasco climbed the last 100 feet alone. Arrived at the top he gazed before him, and then, like a devout Spaniard, fell upon his knees and thanked God that he had been the first European to see the glorious sight; for there, miles away in the distance, lay the promised sea, sparkling in the morning sunshine. Then, having summoned his companions, "See, my sons," he said, "the object of our

desire and the end of our labours; the ocean of which we have heard, and the promise of the lands which now we shall surely find and win. You shall yet be the richest Spaniards that ever came to the Indies." The little party chanted the *Te Deum*, and when this was ended they set to work to carve the name and arms of the King of Castile upon neighbouring trees, in order to show that they claimed possession of the land for their sovereign. Then they began to descend the mountain towards the ocean which they had seen. The journey took them four days. Vasco Nunez, running into the water thigh-deep, and flourishing a shield in one hand and a sword in the other, proclaimed in a loud voice that he took possession of the newly-found ocean for the King of Castile.

The news of the discovery of the South Sea was received with great joy in Spain, for it seemed to reopen the prospect of a westward route to the East Indies, where the Portuguese had by this time a considerable trade by the eastward route. The newly-discovered sea probably offered the way. The difficulty was to get ships upon it. Since it was impossible to drag ships over the mountains, ships must be built upon the Pacific shore. But as soon as ships were built they were found to be rotten and useless, owing to the ravages of a worm which infested those waters. Expeditions were then sent southwards along the Atlantic coast of America to search for a sea passage into the Pacific, but these efforts also failed. The prospect of finding a westward route to the Moluccas seemed as far off as ever.

In this state of affairs there came forward a man who undertook to show the way. Fernando de Magalhaens—Magellan, as we call him—was a Portuguese of noble family, a skilful seaman, a scholar, and an explorer of proved courage and endurance. He had visited India by the eastward route, and he felt sure that there was a way round by America. He carried his plans to the King of Spain. He took with him his friend Ruy Falero, a famous astronomer

of the time, and between them they succeeded in persuading the King that they were trustworthy persons who knew what they were talking about. The King agreed to give them a fleet of five vessels, to man the vessels with 236 Spanish seamen, and to furnish provisions for a voyage of two years.

On 20th September, 1519, Magellan's ever-famous voyage began. On that day his fleet set out from the port of San Lucar in Spain, steering for the Canaries. From the Canaries he skirted the coast of Africa to Sierra Leone, and thence laid a south-westerly course across the Atlantic to the beautiful harbour of Rio de Janeiro. Here the fleet stayed until 26th December, when they proceeded south, carefully examining every inlet until, on 31st March, they cast anchor in a port which Magellan named St. Julian. Here they remained for five months through the winter, which, as you know, is in southern latitudes at the same time as our summer. The cold was very severe, the food was poor, and the seamen began to grumble, and to talk of either killing their foreign commander or forcing him to return to Spain. Magellan put the chief grumblers in irons, but the same night the officers and crew of the *Concepcion* mutinied and seized the *San Antonio*, one of the two large vessels of the fleet. They were soon joined by the *Victoria*, and Magellan was left with two vessels, the *Trinidad* and the *Santiago*, against three. He at once sent off a boarding-party under his brother-in-law, Barbosa, who recaptured the *Victoria* and killed her captain. Then with the *Victoria* and his two loyal vessels he barred the entrance to the bay, to prevent the escape of the other two ships. The mutineers came on, but after a sharp fight were forced to surrender, and Magellan made an example of the ring-leaders by beheading two of them and putting two others ashore among the Patagonian natives.

At the coming of spring, the *Santiago* was sent down the coast to search for a way into the new ocean. She had not

gone far, however, before she was wrecked in a violent storm, and her crew of thirty-five barely escaped with their lives. Magellan, with his four surviving ships, waited at St. Julian until the summer, and then continued the voyage which had been so long interrupted. Inlet after inlet was explored in vain, and again the crews became clamorous to return. It was plain, they said, that the land extended to the South Pole; the farther south they went the wilder were the natives and the less fertile was the land; there were few provisions to be had ashore, and those they had brought with them were nearly exhausted. Magellan's only answer was that he would go on, even if he had to eat the leather from the ships' yards. At last, on 21st October, they found " an inlet like unto a bay ", and two ships were sent in to explore. They had scarcely started when a gale arose, and they were driven helplessly before it. Rushing down the narrow sea between snow-clad mountains, the unhappy mariners expected at every turn to find that the inlet ended in rocky crags upon which they were doomed to destruction. Their companions, riding out the gale in such shelter as they could find at the entrance, had almost given them up for lost when, on the third day, the wind having gone down, the two ships reappeared with flags flying, guns firing, and the joyful news that they believed the inlet was the long-sought way into " the other sea ".

The whole squadron then entered the strait, which to this day bears the name of its discoverer Magellan, and, after sailing through it for 300 miles, three of the ships emerged into the open sea. The fourth ship, sent to explore an inlet of the straits, took the opportunity of slinking off and returning to Spain. The rest of the squadron continued their course westwards across the new ocean, which, as it happened to be calm at the time, was named by Magellan the Pacific, and in March they arrived at the Ladrones. A month later they reached the Philippines, and here Magellan was killed in a fight with some natives. Deprived

of their leader, the Spaniards seem to have forgotten the main object of their voyage, and to have sailed from island to island, plundering the natives and quarrelling over the spoil. Two of the ships reached the Moluccas in November, 1521: one of them stayed there; the other, the *Victoria*, with forty-seven men on board, laid a course for the Cape of Good Hope, and after many perils arrived at San Lucar in September, 1522. Of the 236 men who had set out with Magellan three years before, only thirteen returned in the *Victoria*. They were received with great honour in Spain, and their captain, Sebastian del Cano, was granted a coat-of-arms on which appeared a globe surrounded with the motto: " Primus me circumdedisti " (" Thou first encompassed me ").

From this time onwards the Spaniards competed with the Portuguese for the trade of the East Indies. English maritime enterprise remained backward until the reign of Queen Elizabeth produced some of the boldest and ablest captains who have ever sailed the seas. In the time of this great Queen many trading expeditions were sent to the West Indies, warlike descents were made upon the Spanish ports of South America, and the first British colony, Virginia, was founded in North America.

Drake was the first Englishman to sail round the world. His name became a terror to every Spanish ship upon the seas. In 1587, in one of his daring marauding expeditions, he captured a great Spanish vessel called the *San Felipe*, which was homeward bound from the East Indies. This was in one respect the most important of Drake's prizes, for the vessel's papers disclosed the enormous profits which the Spaniards made out of their trade with India, and suggested to the English merchant adventurers that money might be made more easily by taking part in that trade than by robbing the Spanish settlements in the West Indies, or lying in wait upon the high seas for Spanish treasure ships. Thus was founded the first East India Company.

In the next twelve years, twelve voyages were made by British merchants to the East Indies. In 1613 a new company was formed which fitted out a fleet of four ships ranging in size from 200 to 650 tons, and in a few years our Eastern trade was firmly established.

To the Americans belongs the credit of having made greater improvements than any other nation in mercantile sailing ships, and their clippers became famous, not only for speed, but for the ease with which they could be worked by a small crew. Owing to the abundance of timber in the New World, ships could be built more cheaply there than here, and American ingenuity introduced capstans, winches, and other labour-saving appliances which the old-fashioned seamen of this country long regarded with distrust. The introduction of steamboats upon the Atlantic in the middle of the nineteenth century proclaimed the doom of the fast-sailing clipper on that ocean. In favourable weather the clippers could easily outsail the steamers of those days. In calms, however, or head winds the slowest of steamers could overhaul the fastest of clippers, and on an average voyage the clipper was easily beaten.

In the China trade, however, the clippers held their own for some years after they had disappeared from the Atlantic. The Indian tea trade had not been developed, and the bulk of our tea came from China. High prices were paid in the market for the earliest deliveries of each year's crop, and there was keen competition among the captains of the China clippers to be the first to arrive in England with the precious little leaf.

The coming of steam and of construction in iron and steel opened a new chapter in the history of transport by sea as in that of transport by land, and helped in no small degree to exalt this country to the pinnacle of commercial greatness on which she stands to-day.

CHAPTER VIII

Modern Ocean Carriers

We know that as long ago as the year 1690 a French scientist discussed the subject of ship-propulsion by steam, and that fifteen years later experiments were actually made with a steam-driven vessel; but it is highly probable that even then the notion was one of some antiquity. It was not, however, until the beginning of the nineteenth century that theory was put into practice by Henry Bell, of Glasgow, and Robert Fulton, an American, both of whom flourished at the beginning of the nineteenth century.

The American steamboat *Claremont* plied between New York and Albany; while Bell's vessel, the *Comet*, ran between Glasgow, Greenock, and Helensburgh. Interesting, however, as the history of these pioneer craft and their immediate successors would be, it has not much bearing upon the subject of deep-sea steam navigation, and we must therefore pass it by. The man who first saw the enormous possibilities of the new method of propulsion—or, at any rate, the man who first took steps to turn them to account—was David Napier, a Scottish engineer who had made the castings for the engine of the *Comet*. In the year 1818 a steamer named the *Rob Roy*, built at Dumbarton and engined by Napier, began to run regularly between Greenock and Belfast; and within a few years' time quite a number of sea-going steam vessels were afloat. In 1819 a steam-driven ship first crossed the Atlantic, but

she was what we should call nowadays an auxiliary vessel —one, that is, in which the machinery is only an adjunct to the sail power, and is not employed when good progress can be made under canvas.

The real conquest of the Atlantic was made in 1833, when the *Royal William*—which had been running for some time between Quebec and Pictou, Nova Scotia—was dispatched to this country, accomplishing the journey in seventeen days. Her length was 176 feet, and her breadth 27 feet; the *Aquitania* is 901 feet long, and has a breadth of 97 feet.

It would be wearisome to trace the subsequent course of events in close detail. Each individual step made in developing and improving the new means of ocean transit was, without doubt, highly interesting in itself, but to describe every forward movement fully would be to tell the same sort of tale over and over again. Let us therefore pass on to the day when something out of the common took place. In the year 1858 there was launched the *Great Eastern*, a vessel which was as great an advance on anything that had gone before, as a ship half a mile long would be to-day. The twin sciences of naval architecture and engineering had, in those days, not made the progress which they have since achieved, and in consequence the *Great Eastern* was a hopeless failure. She was 675 feet long, and of 18,918 tons, and was propelled by paddles and a screw as well. Such a combination was, of course, ludicrous, and the 20-knot speed which the vessel was expected to attain dwindled down to about 14 knots in actual practice. Her ill luck began even before she was in the water. She was to have been launched on 3rd November, 1857, but she stuck on the ways, and by an accident to a winch one man was killed and several were badly injured. It was not until the end of the following January that success crowned the efforts to get her afloat, and in the meantime her builders had gone bankrupt, and the com-

pany that owned her had to be wound up. In September, 1859, she made her trial trip, and the occasion was marked by an explosion on board her, which killed six men and injured others. In her time she acted as a troopship, but the most useful work which she accomplished was that of laying submarine cables. At the close of her career she was used as a floating advertisement by a big Liverpool firm of wholesale providers, and in the end she was broken up on the shores of the Mersey.

Not very long after the *Great Eastern* had been weighed in the balance and found wanting, paddle wheels as a method of propulsion for ocean-going steamers were finally abandoned, while another step of vital importance was that of using steel, instead of iron, as the material of which ships' hulls were constructed. But for these two alterations in shipbuilding practice we should never have had an *Olympic* or an *Aquitania*.

In due course there came another innovation which had an equally far-reaching effect—i.e. the adoption of twin screws in place of a single propeller. In the old days a vessel which had a break-down in her engine-room, or fractured her propeller shaft, was as helpless as a log. She might drift about for weeks if she had not the good fortune to fall in with another ship, and in the meantime those on board her might be brought to the brink of starvation. If a twin-screw boat meets with a similar accident she can easily reach port with the aid of her remaining propeller, the only trouble experienced being that her speed is somewhat diminished.

But we have run rather far ahead in our story of the process of evolution which has led up to the modern liner. We must hark back to the year 1879, for it was then that the question of high speed first came really to the fore.

For a while, every big company running boats on the New York route strove to outdo its rivals, but the craze

of late seems to have died away. The White Star Line were the first to abandon it, and the other lines have gradually followed suit. We have spoken of the contest as a "craze", because it is doubtful whether the game was ever really worth the candle. The expense of very high speed is enormous. For every extra knot per hour above a certain number the coal consumption almost doubles itself. Nowadays the tendency seems to be to give the passenger more for his money in other directions.

Not so very long ago the passenger liner which had a fairly handsome dining-saloon, a comfortable smoking-room, and a daintily-furnished drawing-room for the ladies was regarded as giving all that the heart of the traveller could desire. To-day she would be indeed a "back number". One frequently hears our modern liners described as floating hotels, but the term is utterly inadequate. "Floating palaces" would be a better expression. The twentieth-century voyager demands—and is given—music-rooms, *à la carte* restaurants and grill rooms, palm gardens, gymnasia, swimming baths, racquet courts, and electric lifts. The one great aim of the big steamship companies, in fact, seems to be to make the passenger forget that he is afloat, and to give him the impression that he is taking a holiday in some royal residence of a peculiarly luxurious character. It is difficult to think of any further additions which could be made to the list of attractions held out by the "crack" liner of to-day.

One sometimes hears it jokingly suggested that the steamers engaged on the transatlantic route will in time be big enough to have golf links aboard them, but that day will not come while the present generation is alive, for the simple reason that our passenger liners have almost reached the limit in the matter of size. It would, of course, be possible to build boats twice or three times as big as the biggest now afloat, but there is an obstacle, apart from any difficulty with regard to construction, which for many years

will prevent anything of that sort taking place. Every vessel has to go into dry dock at intervals. The exterior of her hull is continually becoming encrusted with weed and other marine growths, and if these were not scraped away periodically her speed would be so diminished that she would become as slow as the veriest old tub. Again, she may meet with an accident which necessitates repairs. In order that she may be repaired she must go into dry dock, for the work could not be done satisfactorily by divers. Thus it will be seen that a dry dock big enough to take her in is an absolutely essential factor in the life of a modern steamer. Now the largest one in the world is only 149 feet more than the length of the *Aquitania*. It is therefore evident that a vessel of, say, 1100 feet would be in a sorry plight. Thus the question works round in a sort of circle. Bigger vessels cannot be built because there are no dry docks for them, and bigger dry docks cannot be constructed because there are no vessels large enough to make them pay. We may therefore take it for granted that it will be a long time before we have another period of sensational developments in big-ship building.

This, of course, refers to the North Atlantic trade, where the leviathians are to be found. On other routes the process of evolution will probably continue for some time to come, for the vessels employed on them have not yet reached anything like the limit in the way of size, and consequently there is room for them to expand.

Naturally everything depends on the manner in which the trade on each route expands. Shipowners, after all, are only carriers. They do not create the traffic; they simply provide the means for conveying it from one point to another, and they therefore have to adjust their arrangements to meet the requirements of their customers. It would be useless, for instance, to put an *Aquitania* on the service between this country and South Africa, for a very large proportion of her passenger accommodation would never be

filled, and she would thus always run at a dead loss to the company that owned her.

The marine engine of to-day is a vastly different affair from that which propelled the *Comet*. The adoption of the triple-expansion system practically revolutionized ship propulsion, giving a tremendous increase of power or a corresponding decrease of expense. In the triple-expansion engine the steam is used three times over, and thus almost every ounce of energy which it contains is turned to account. From the boilers it passes to what is known as the high-pressure cylinder; from there it goes to the intermediate cylinder, and so in due course to the low-pressure cylinder—driving a piston in each, and so giving a threefold impulse. In some modern steamers the principal is carried further still, quadruple-expansion engines being employed. An engine which is put in motion by admitting steam to a cylinder and so forcing up a piston is known as a reciprocating engine; but towards the end of the nineteenth century there came a fresh development which has carried marine engineering a long stage further.

This development was the coming of the turbine principle, the invention of the Honourable Charles Parsons. By means of this system, direct action is obtained. The steam from the boilers impinges on a multitude of little blades set on a wheel which is attached to the propeller shaft. Thus there is none of that loss of power which invariably occurs when an arrangement of levers interposes between the impulse and final action. For a considerable time, however, there were drawbacks attached to the turbine principle. For instance, it was not possible to reverse the engines—a most serious disadvantage, for ships must be able to go astern when occasion requires. This obstacle was surmounted by the introduction of a separate turbine for reversing purposes. Another difficulty has been that the turbine is apt to drive the propeller at too high a speed. To call this a drawback may seem contradictory, but the fact is that it is not desirable

that a propeller should revolve with extreme rapidity. When it does so it loses force. What is known as a " cave " is created in the water, and the blades fail to get a proper grip. But here again the difficulty was surmounted. A system of gearing between the turbine " rotor " and the propeller was introduced, with the result that the latter revolves at a much slower speed than the former. In some of our very big liners the reciprocating and the turbine systems are employed conjointly.

While the steam-engine has been undergoing the long process of evolution that has brought it to such a pitch of perfection, there has arisen a rival which in the course of time will possibly drive it out of the field. There is a vast difference between a vessel which burns oil fuel and one which is driven by oil-engines. In the one instance oil is simply employed as a substitute for coal for the purpose of raising the steam which drives the engines in the ordinary way; in the other it drives the engine itself, in much the same way that petrol provides the motive power of a motor-car. Strictly speaking, however, it is not correct to compare the Diesel engine with the motor-car engine. In the case of the latter a very high-grade oil is employed, and the impulse is provided by a succession of explosions; while in the former the oil used is of the crudest and heaviest description, and the impulse is more in the nature of a push.

Up to the present the Diesel engine has been found more suitable for small vessels than for large ones, but the difficulties which exist will, without doubt, be conquered in time. The chief of them is that of cooling very big cylinders. The heat inside these cylinders is enormous, and the process of keeping down their temperature—which is effected by means of a water-jacket—is apt to cause the metal to crack. However, we may rest assured that as time goes on this obstacle in the path of progress will be removed.

The advantages attached to the oil-engine system of propulsion are many. In the first place, the machinery

takes up far less space than does the steam-engine; the number of men required is less; and the amount of room which in a steamer would be occupied by coal bunkers is to be added to that gained in the manner shown above. Instead of needing separate compartments, the oil can be stored in the double bottom of the ship, a space which in a steamer is occupied by water ballast. Another advantage is the cleanliness of oil, as contrasted with the extreme dirtiness of coal, and the rapidity with which the former can be pumped on board, as compared with the slow process of " coaling ship ".

It must not, of course, be supposed, from what we have said, that the days of steam are nearly at an end. Oil may gain the victory sooner or later, but the fight will be a long and uphill one. In all probability we shall have a repetition of the story of the battle between steam and wind propulsion, the new-comer gradually wearing down its rival.

There is also electricity to be considered. Some people profess to believe that a ship so propelled has a big future before it. Electricity is, of course, very largely used aboard ship nowadays for lighting purposes. Every big liner employs it exclusively, and a great proportion of our tramp steamers are electrically lighted. In other directions, too, electricity plays a highly important part on board the vessels of our mercantile marine. It is used for heating saloons and staterooms, for working lifts, for controlling the closing of the doors in the water-tight bulkheads, and for providing communication between bridge and engine room; besides the invaluable services which it has rendered in another direction—that of wireless telegraphy.

The inland dweller usually supposes that all steamers are built on very much the same plan. In reality, however, there are many different systems of construction. Where the cargo boat is concerned, the great aim of the shipbuilder is to provide large, clear holds, coupled with the utmost possible structural strength. The ship is a big box, made

of steel plates which are riveted together; yet she has to be able to withstand conditions more trying than anything else made by the hands of man ever meets with. But for the scientific manner in which she is strengthened internally, she would sag and break. Strength is imparted to her by steel beams running lengthways and crosswise, and it will be evident that if there were too many of the latter the usefulness of the vessel would be seriously interfered with. Her holds must be clear of obstructions, and they must be large. Moreover, it is necessary to keep down the weight of the ship as much as possible. Shipbuilders are all the while striving after perfection in these respects, and many patents have been taken out for new principles of construction.

The principle of giving strength longitudinally instead of traversely has been particularly successful in its application to oil-tank steamers, and this, by the way, brings us to the consideration of another special type of vessel. The "oil-tanker", as her name implies, carries nothing but oil, and carries it in bulk. She is, in fact, an ocean-going tank. Tank steamers are to be met with on every one of the seven seas, for nowadays oil is obtained practically all over the world.

At some places the method of loading them is most interesting. At certain ports in the Gulf of Mexico, for instance, the "tanker" lies at a distance of fully 2 miles, and the oil is pumped out to her through a pipe line laid along the bed of the sea. The reason for this is that at each of these ports there is a dangerous bar, and that it is unsafe for vessels of any considerable size to venture close in. The carriage of such large quantities of explosive material is naturally attended by danger. Nowadays, however, the arrangements are so perfect, and the precautions taken are so stringent, that casualties are rarely heard of. There are hundreds of oil-tankers afloat, and the extent of the trade in which they are engaged will be realized when we state

that the largest of them will carry about 15,000 tons of oil.

A trade which has developed enormously of late years is that of chilled and frozen meat, and a special type of steamer has come into existence to meet its requirements. When it is remembered that in bringing their cargoes to the United Kingdom these boats have to pass through the torrid heat of the Equator, it will readily be understood that their internal arrrangements are highly complicated. If the refrigerating machinery were to fail in its duty for ever so short a space of time, many thousands of pounds' worth of meat would be ruined. The process of creating artificial coldness, too, is not the only one that comes into play. The chambers in which the meat is stored have to be insulated in such a fashion that the external heat cannot affect the temperature inside. When the tropical sun is beating down on a vessel, it becomes necessary to set up a barrier against the heat; and this is done by erecting an inner wall of wood, and filling the space between it and the outer wall with non-conducting material, which usually consists of charcoal or silicate cotton. With regard to the refrigerating machinery itself, there are three different systems in use—air compression, ammonia compression, and carbonic anhydride compression, in all of which systems the object is to extract heat from the cargo chamber.

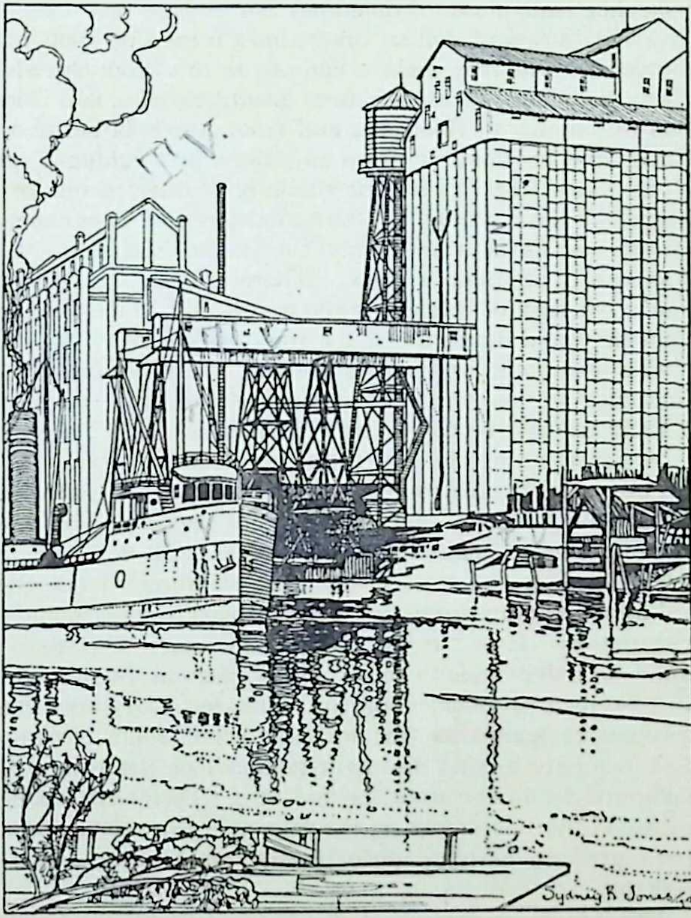
It must not be supposed, by the way, that the steamers fitted with refrigerating machinery carry nothing but chilled or frozen meat. Many of them are fine passenger liners. Some of the P. & O. boats, for example, have refrigeration installations; and several other notable companies have vessels fitted in this manner. At some of the South American ports—whence comes the greater portion of the chilled beef shipped to this country—there are huge barges fitted up with refrigerating machinery and insulated cargo space. These are employed in carrying the meat from the depots wherein it has been stored ashore to the steamer which is to take it overseas. Some of these craft are huge concerns,

over 200 feet in length, and having 60,000 cubic feet of insulated space aboard them.

The humble "collier" is by no means the least interesting unit in the mercantile marine of a country which produces and consumes vast quantities of coal. Many of our modern colliers are really handsome boats of considerable tonnage, fit to go anywhere, and equipped with complicated machinery for discharging their cargoes. It must be remembered that the carrying of coal from one port to another round the coasts of the United Kingdom is only an item in the entire trade. There are vast depots overseas, thousands of miles away, where fuel must be stored for the passenger liner or the tramp steamer to pick it up when required; and it is the collier which carries out the supplies to these centres. Thus she is as much an ocean-going craft as the biggest liner of them all.

So perfect are the internal arrangements of some of our most modern colliers that scarcely any manual assistance is required in discharging their huge cargoes. Machinery trims the coal, puts it on to conveyers, runs it ashore, and pours it into the trucks which are standing on the quay, only about half a dozen men being needed to superintend the operation. It is not an uncommon thing for a vessel of this type to be able to get rid of her cargo at the rate of 700 or 800 tons an hour. Some of them, too, carry a weighing apparatus known as the porhydrometer, which automatically registers every ton as it goes out of the ship. The importance of the trade carried on by these craft may be gauged by the fact that in the year 1911 the amount of coal exported from this country reached the gigantic total of 64,599,266 tons.

People whose lifework does not bring them into constant touch with shipping are apt to overlook the importance to this country of the "tramp" steamer. Day by day, year in and year out, vast food-supplies are pouring in through our seaports, and it is the tramp steamer that brings them.



Grain Elevators, Fort William, Lake Superior

The carriers on the great lakes are virtually enormous barges, so built that their cargoes can be loaded, trimmed, and unloaded with the utmost dispatch.

There is no corner of the world into which she does not poke her snub nose. Sometimes her voyage may extend over only a few weeks; at other times it may be spun out for years. She may make a run out to the Black Sea and back, or she may go from here to South America, and from South America to Australia, and from Australia across to Chile, and so home again round the storm-ridden Cape Horn. Like the British army, she is " ready to go anywhere and do anything ". The total tonnage of our mercantile marine is considerably over 18,000,000 tons, and it is safe to say that from 60 to 70 per cent of this huge figure consists of tramp steamers. It would be well if someone could devise a better name than " tramp " for the vessels which do such yeoman service. It is an ugly term, and one that is calculated to inspire contempt, whereas in truth we have reason to be immensely proud of the craft to which it is applied.

Few people in this country have any idea of the extent of the shipping trade on the great Lakes of America, or of the size of the vessels engaged in it. The craft plying on these inland seas are of a type altogether different from the ordinary ocean-going steamer; but many of them are huge, and the amount of cargo which they carry during the course of a year is enormous. The majority of them might be described as glorified barges. Despite their great size they are comparatively shallow, the reason for this being that they have to pass through channels where the water is shallow. Iron-ore forms the principal item in the traffic on the Great Lakes, but tremendous quantities of coal and grain are also carried, while lumber plays an important part too.

The " bulk freighter ", as the Americans call the Great Lakes cargo boat, carries " bulk " cargoes, i.e. cargoes composed entirely of one class of natural product, as distinguished from those which consist of varied assortments of manufactured goods. The boats themselves are so designed

as to be able to take in and get rid of their freightage with the utmost possible rapidity. One can imagine the thunderous roar which would accompany the operation of pouring a heavy mineral into a vessel at prodigious speed. The " bulk freighter " always has her machinery aft, an arrangement which, while it certainly does not make for elegance of appearance, is very convenient for the purpose of dealing with the class of cargo which she carries.

It would be scarcely fair to conclude our remarks on ships and shipping without making any reference to the dredger. So important is the dredger that the work of constructing her has become quite a specialized branch of the shipbuilding industry. It is on the Clyde that most of these vessels are built, and there are two types—the bucket dredger and the suction dredger. The former is used in places where the material which has to be removed is of a solid nature, while the latter is employed when sand, mud, or gravel has to be dealt with. In the bucket dredger we have a number of steel buckets running on an endless chain, and in the other type the dredging apparatus consists of a huge pipe, up which the sand or mud is sucked by powerful pumps.

As an illustration of the amount of work which is done by these craft, I may tell you that, in removing two banks which blocked the way into the River Mersey, 126,000,000 tons of sand were cleared away by the suction process; and that a bucket dredger recently constructed at Paisley can bring up 2000 tons of solid material per hour from a depth of 50 feet. Although they do not belong to the ocean-going class, these craft sometimes make very long journeys, travelling to such far-distant parts of the earth as Australia or New Zealand, in order to dredge new channels to the harbours there. As a rule, they are towed to their destinations.

CHAPTER IX

Railways and Railway Builders

The city sleeps. For the few short hours of night its wheels have ceased to hum, and its tens of thousands of workers have ceased to struggle. Lethean dew holds all in a sweet equality; hopes and fears and all the terrors of the battle are oblivion. The day's smoke has been swept away, and the moon peeps through the night wrack to take toll of those whose limbs are stiffening in their last sleep, to welcome the babes that will take their place, making the city solemn and beautiful with its smile.

That is the sort of picture of a sleeping city that is familiar enough in these days of cheap novels. I have read the same kind of thing a hundred times. Let us see whether we cannot find an aspect that is not quite so trite and commonplace. In every city there are corners where men work furiously while their fellows sleep, and give never a thought to the smiling moon. A journey at dead of night through the Potteries or one of the great iron-smelting districts will reveal a dozen Valleys of Hinnom, lurid and frightful, with fierce flames continually licking at the darkness. Yet it is not with these that we have to do, but with an industry of the night that is far greater; I speak of the railway.

An industry of the night? Truly. And I want to hold the curtain aside for a moment while you peep at the wonders of a great goods station as they are revealed at night-time.

Come quietly then (strangers get in the way and are disliked), and let us creep into the station yard. *A lot of carts?* Yes—mind that motor van! What?—*they're funny carts!* Ah! To be sure, so they are; insulated vans for carrying frozen meat. But we will get inside the station —this way, up on the loading platform—and see what goes on there. Now look at this train, with half its vans " struck "; small wonder that a lot of vans are needed to cart its freight. Yes, it is all meat—frozen meat from the River Plate—twenty van-loads in all. It looks a lot when you see it all together, yet it is but a scrap in the giant's maw. Ah! here you are: look along the dock now—a new train has just backed in; now the double doors of the vans are unbarred, porters and barrows appear from nowhere in an instant, a dozen fresh carts are backing on to the platform. *More meat!* Yes, this train has been run up from Scotland at express speed, and its freight of prime beef must be rushed off to the meat market before the stalls open at four o'clock this morning. Yes, it is hot work for the porters. They have to race against time in order to provide your dinner. The doors are banged to, and the train hauled slowly out of the station. When it gets to its siding, water from a hose will be splashed into all the corners of the vans and they will be scrubbed down. Did you notice their steel linings and concrete floors? Those vans must be kept sweet at all costs.

Isn't there anything besides meat? Of course there is. Now, what about breakfast?—your own comfortable, well-ordered, substantial, eminently satisfactory breakfast? You don't need to be told that fish comes to this unloading dock. Do you like bloaters? They are in season now, and coming in by the train-load from the east coast. Did you ever see so many boxes? Did you ever realize that they could be stacked and stacked and stacked again until one could almost get lost among the stacks? *What is it that crane is lifting?* Oh! That is a tank full of fish. The

fish is caught in the North Sea, packed straightway into the tanks as soon as it can be put aboard the steam carriers that collect it from the trawlers, and brought to Grimsby. There the tanks are swung out of the carriers; then they are dropped on to railway wagons, swung off in the goods stations of a hundred towns, and hauled off to market. There is no sense in handling a perishable thing like fish more often than need be. Yes, those wagons—box vans such as the meat came out of—hold fish too, tons of it. But it is packed in boxes, and will be delivered in small lots to fishmongers all over the town. Salt-water fish was a great *luxury* in most inland towns within the memory of the middle-aged, instead of a common article of daily food as it is now. Fish pours into the country from the east coast ports in a never-ending stream, and from other ports as well. Grimsby alone dispatches between two hundred and three hundred of those trucks you see there *every day*.

Eggs and bacon? There are tons of dairy produce in the vans at the next " bank " waiting to be unloaded. Monday morning is always a great time for the delivery of eggs and bacon, and butter and cheese, and the like. They are shipped over from the Continent during the weekend, and find their way into the warehouses and shops all over the country by the time you are having your breakfast on Monday morning. Those two vans, unloading now, contain nothing but eggs. Those cases of eggs are interesting, because they represent a great industry built up of very small units. Our farmers' wives could pocket the profits that now go to peasant proprietors all over Europe. Our farmers' wives will do so, in time, no doubt; but they are slow to learn that an egg's value depends on the fashion in which it is packed and sent to market.

Odd, is it not? Notice, then, that the cases of eggs you see here are all exactly alike in shape and size: each one contains the same number of eggs, so many long hundreds, clean and carefully graded and sorted. Look; this railway

van is completely filled with such cases. Doubtless one of the steamer's holds was completely filled with them.

Have you seen enough food? I can show you truck-loads of market-garden stuffs that were growing yesterday in Bedfordshire, Cambridge, and Huntingdon; or vans and all sorts of odd vehicles—even obsolete third-class carriages—laden with thousands of baskets of strawberries; but enough! Let us get away from the smell peculiar to our city's exuberant dietary.

Outside the sheds the scene is more beautiful but no less busy. These are the marshalling and sorting yards, where the goods trains are made up and the thousands of wagons composing them marshalled in their proper order, so that they can be dropped off the trains at their destinations without unnecessary waste of engine-power in shunting them. A kaleidoscope of trade is here. Tarpaulin-covered railway trucks, ugly enough in themselves, are made subtly beautiful in this great yard with its miles of movement. See them pass and pass again; watch their shadowy bulk harden as they draw into the light, grow distorted a moment, then dwindle again to fantastic shadows as they drop into blackness beyond. Catch the rhythm of their song as the countless wheels click-click over the rail joints. There is music to-night in this ever-waking corner of our sleeping city; and the clang of many buffers, and the whimpering of a dozen engines, and the shouts of the workers are made mysterious by an ever-lasting echo, like a rough voice in a cavern of many chambers.

Yes, there is a glamour in this great goods yard, this mighty giant that slaves to keep us fed and clothed, but a glamour that is only for the looker-on. The giant is cruel, ruthless of life and limb, unheeding of a widow's sobs or an orphan's wail. How many times has an awful scream ascended to the black sky above this yard? How many times have brakes ground and tires skidded on greasy rails, while whistles sounded their appeal for help? Alas! Our

daily bread costs us dear in the price of men's lives, one way and another. The railway authorities do all they can. The fault, if fault there be, is ours, not theirs.

You remember that that great man, Richard Trevithick, made the first locomotive ever seen in Great Britain. That was in 1804, in which year it successfully hauled a train on a tram road at Pen-y-Darren near Merthyr Tydvil. It was the success of Trevithick's locomotive that really laid the foundation of the railway. You must understand that the railway itself, i.e. a track on which vehicles run, is a very ancient institution. When collieries began to develop in the north country, about the beginning of the seventeenth century, it became the fashion to lay down wooden "tram lines" over which the cauldrons were hauled to the nearest river staith. At a later date the wooden lines were shod with iron, and eventually became superseded by cast-iron rails, of one pattern or another. But though these lines were satisfactory enough for the light wagons drawn by mules or ponies, they were not strong enough to withstand the weight of locomotives.

George Stephenson's is the name we most often associate with the birth of the railway system. I have seen it seriously written that he was the inventor of the railway; of course he was nothing of the sort. The railway is not an invention of any one man, but an agglomeration of inventions of many men and many periods.

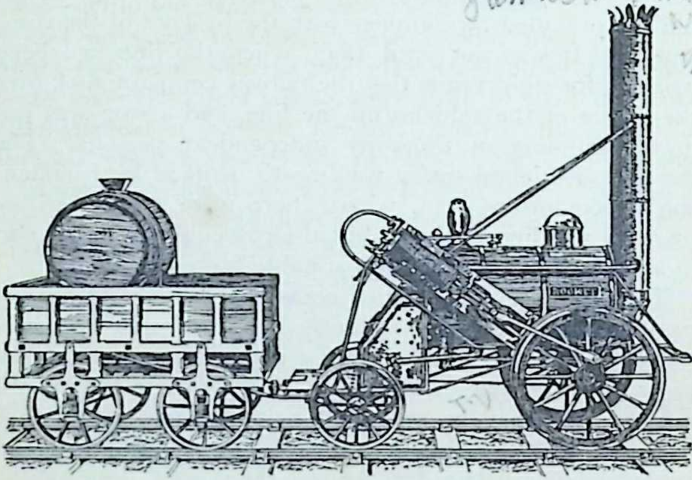
The first public railway worked by locomotives was the Stockton and Darlington line, built by George Stephenson and opened in September, 1825. There are people living now who were alive when "the immense train of carriages" (amounting in all to about eighty tons weight) drawn by Stephenson's engine, "Locomotion", arrived at Darlington for the first time, and the railway was declared open for public traffic. The engine, "Locomotion", is historic on that account, but it was not the first locomotive built by Stephenson, neither was it altogether successful. Pre-

judice against " travelling engines " was so strong in those days, and their advantages over horse traction were so doubtful, that the promoters of the Stockton and Darlington Railway had no intention of using them when they obtained their Act in 1821. This Act said that " Any person is to be at liberty to use and run a carriage on the railway provided he complies with the by-laws of the company ". It was not until 1833, when the line had been working for eight years, that the railway company took over the whole of the vehicles on the line, and a stop was put to the running of them by independent persons. The goods and mineral traffic was mostly worked by Stephenson's locomotives, and, where there were steep inclines, by fixed winding engines; but the passengers were carried in stage-coaches mounted on suitable frames and wheels.

The line was single, with occasional refuge sidings, or passing-places, and it frequently happened that two passenger coaches, or a coach and a goods train, would meet at a spot where one or the other had to retire to the nearest refuge. We may be sure that neither party would give way to the other without a great waste of argument and expostulation, in the days before there were time-tables, and when there existed no definite regulations governing the " rule of the road ". Occasionally, when the coaches met, the occupants would get down and fight it out, the vanquished party having perforce to travel back to the siding, while the victors followed, elated, but probably out of breath. There must, indeed, have been a spice of adventure about the new mode of travelling, though it had a drawback in its uncertainty, and was no more comfortable than the stage-coaches on the roads. Yet it " caught on " amazingly, and the earliest passenger trains were well filled. We are told that the passengers were not at all particular where they rode. They crowded the coaches on the tops, the sides, or any part where they could get a footing. They frequently tumbled off, of course,

but that only added to the fun, and as the speed was not more than 8 or 9 miles an hour, I do not suppose they were much the worse for their tumbles.

As I have said, the locomotive was regarded with disfavour by all but a few enthusiastic men. For the most part



George Stephenson's "Rocket"

locomotives inspired the most intense hatred, and even as late as 1829 Parliament granted the Newcastle and Carlisle Railway Act only on condition that no engines should be used on it. We are slow to learn and slow to adapt ourselves to altered or altering circumstances. Our grandfathers and great-grandfathers did not say: "We will see whether there is anything in these newfangled ideas—good may come out of them". What they did say was: "We hate *the idea* of these railways, and we *will not* have anything to do with them".

It is impossible to harm a good thing by hating it; and when at length the Liverpool and Manchester Railway had

fought its way to completion, and George Stephenson's "Rocket" had completely vindicated the powers of the locomotive, it was useless for people seriously to set their faces against an innovation that immediately proved itself to be a blessing beyond the vista of the liveliest imagination. The boilers did not burst—at least, not often—cows still gave their milk, horses, instead of being no longer wanted, became more valuable, because there was more work for them to do. None of the evil prophecies came to pass; but instead, farmers, traders, consumers—the whole community—found in the railway a magic conduit of prosperity that seemed to settle on all within its reach.

It was at this stage, when the railway was no longer a toy, but was showing itself a resistless giant with mighty powers for good, that the opposition to it became strongest. Parliament was of course quite in the right when it set out to protect existing interests against the onslaught of railways, but its machinery was cumbersome and grossly expensive. Millions of money were wasted in obtaining Acts. Thus, the South-Eastern Railway Company expended £82,000 before they could obtain the Act authorizing the construction of the line—this, mark you, before a rood of land had been purchased.

The prices which the railways had to pay for land were even more iniquitous, and it is difficult to forgive the landowners of the early part of last century for the burden they imposed on their country. Their attitude to the railways was: "If you want the land you must pay for it—at our price". Thousands of men were paid fancy prices for the land wanted for railways, in addition to what they were pleased to term "moral" or "consequential" damages,[1]

[1] One landowner was paid £8000 for a plot of land and £10,000 as "consequential" damages. Instead of damaging the remainder of his property the building of the railway increased its value by 20 per cent. This landowner was less generous—or rather should one say less honest?—than the Duke of Bedford, who voluntarily returned £150,000 paid to him as compensation, when he found that the railway increased the value of his land instead of depreciating it.

on the strength of threats that if the sums demanded were not forthcoming the owners of the land would oppose the railways and involve them in long and tedious litigation. The Eastern Counties Railway was made to pay no less a sum than £120,000 for a parcel of land said to be worth then not more than £5000.

In some instances towns refused to have anything whatever to do with the proposed railways, and opposed their coming to such an extent that the lines had to be diverted in order to avoid them. Of these Northampton is the most famous. It was proposed that the London and Birmingham Railway should pass through this town, but the inhabitants were so bitter against the railway undertaking that it was decided to avoid the town altogether; it was indeed a veritable hornets' nest, and there was nothing else to be done. What that town has lost by its shortsighted policy cannot be properly estimated, but the loss was certainly tremendous, for the original proposal was to build the locomotive and carriage works of the company at that place. Of course within a few years of the opening of the line Northampton was crying out for a railway.

A recent writer on Canada has said: " Through its railways Canada lives and grows ". Canada is not peculiar in that respect; the same thing might be said of any country, for it is true of all. But there is a romance about the great transcontinental railways of Canada that makes them appeal to us in a special sense. They are the biggest things in that land of big things. Apart from the actual running of the trains and steamers, and the business proper to a railway company, the Canadian Pacific Railway has a great variety of other interests making for the prosperity of the country. There are the interests involved in the administration of the vast tracts of land given to the company by the Canadian Government; great schemes of irrigation, the result of an effort to make productive, in more ways than one, a section of country that would otherwise be an eyesore on

the company's main line. And apart from these there are great mining interests to be looked after, the development of which, along with large tracts of timber lands, is in the hands of this great railway company.

The Canadian Pacific Railway provides the longest through route under one management in the world, and claims as its termini Liverpool and Yokohama, the journey between these places occupying three weeks. The main line of the railway from the Atlantic to the Pacific is 2904 miles long. It was completed in 1885, more than five years before the stipulated time.

All the same the company has had to pay dearly for this hurry in construction. The line was thrown down as hurriedly as supplies could be brought up, and vast sums have since been spent on re-alignment, in order to avoid severe gradients, especially in the Rocky Mountains. The great object of railway builders nowadays is to obtain as level a line as possible. It costs less to haul a train over 10 miles of level road than up a single steep hill, perhaps less than 1 mile long.[1] George Stephenson realized this, but very few of his contemporaries did. Early railway engineers aimed at building a direct road, and took their lines over hill and down dale rather than incur the expense of heavy engineering works, such as big bridges and embankments, long tunnels, and deep cuttings. The Canadian Pacific Railway provides a very famous example in the line which runs through the Kicking Horse Pass.

Kicking Horse Pass is one of the few gaps through the great barrier of the Rockies that have so far been utilized for the lines of communication running from east to west across Canada. The men who built the Canadian Pacific

[1] To show more clearly what is meant, it may be said that an engine capable of hauling a train of sixty loaded wagons, weighing, say, 900 tons, on a level line at a speed of 30 miles an hour, will only be able to haul half the load up an incline of 1 in 100, and a quarter of the load up one of 1 in 50. Of course this is not a hard-and-fast rule, for special types of locomotives are now built which are capable of dealing with heavy loads on any average road.

Railway took the first trail they could find. They were a long time in finding it. But at length the Kicking Horse Pass was explored and found to afford a feasible route for the railway, though not by any means a desirable one, since it involved a steep ascent. Over this hill, however, the railway had to be carried. From the first it became known as the Big Hill; but when the railway was young and the traffic light, an ascent more or less was of small account. It was not until the whole service was speeded up, and trains grew faster and heavier, that the 4 miles up the Big Hill really became a thorn in the side of the authorities. Trains going up needed extra assistance from four or five locomotives, which pushed behind; trains coming down sometimes ran away and were derailed. The engineers set to work to see what could be done, and they followed out a plan which cost the company a quarter of a million sterling, though it only entailed the building of 8 miles of new railway line. They made the line wind round and round, doubling back upon itself, corkscrew fashion. To do this they had to cut two spiral tunnels, similar to those on the St. Gothard Railway.

The debt that the world owes to the railway pioneers can never be told. I was reading not very long ago an account of the West African Government Railways, and as I read I wondered that nobody had thought it worth while to write the history of the amazing adventures of Sir William Shelford and his colleagues. The trials and troubles that the builders of these railways had to endure would provide a misanthrope with several hours' good reading.

The troubles began at the very beginning. In one case—that of the Gold Coast Railway—the party of surveyors that had been sent into the dense bush to mark out the route of the line fell victims to malaria. One man died, and the survivors crawled back to the coast broken men. Much valuable plant and still more valuable stores were lost while they were being landed in the heavy surf that always prevails

off Secundee. These, however, were slight accidents compared with those that marked the construction of the railway. The greatest set-back to the work arose from the denseness of the great forest belt that stretches inland for about 150 miles. The railway builders were prepared to face all risks, and the unhealthiness of the climate had small terrors for them, though the forest abounded in stagnant swamps, on which swarmed malaria-carrying mosquitoes. Thanks, however, to Major Ronald Ross's great work, explorers are now able to invade tropical countries armed with a surer weapon than rifle or shot-gun—a knowledge of the habits and customs of the mosquito; and therein lies their safeguard.

It must indeed be disconcerting to a railway engineer in the Tropics to discover one fine morning that the pegs he has driven into the ground to mark the centre line of his track have sprouted and developed into fine healthy trees, so that he cannot find them again—as pegs. That was what happened in West Africa. Another effect of this good growing weather, as a farmer would call it, is to make it impossible to clear the bush much in advance of the construction gangs, for the simple reason that a clearing is overgrown again almost immediately. The greatest difficulty experienced in the building of the West African lines, however, arose from the falling of trees on to the lines. All trees which might fall and damage either the railway or the telegraph lines had to be cut down. As the trees commonly reached a height of 150 feet, it became necessary to cut a roadway 300 feet wide in addition to the width of the railway. The area actually cleared represented about 40 acres to a mile of line, and there were about twenty really large trees to an acre, as well as smaller trees and undergrowth. "Some of the trees met with in the West African forests are very large, measuring 20 to 30 feet in circumference at the base and furnished with large buttresses. Such a tree will take two or three days to cut down. . . . The

tree when felled is by no means disposed of. It has to be cut into sections and rolled aside. The very large mass of small branches, as well as the undergrowth, has to be cut up, dried, and burnt. The stump of the tree also causes difficulty. It has to be dug round, the roots have to be cut, and the stump must be dragged out and hauled aside, unless its position is such that it can be allowed to remain."

The builders of the Uganda Railway were beset with dangers from wild beasts. At one point, where a bridge had to be constructed over the Tsavo River, two man-eating lions caused such dreadful depredations that panic reigned in the construction camp, and it was impossible to progress with the work. Lieutenant-Colonel Patterson, the engineer-in-charge, eventually succeeded in shooting the man-eaters, but not before they had devoured, between them, no fewer than twenty-eight Indian coolies employed on the bridge work, in addition to scores of unfortunate African natives of whom no official record was kept.

Although to-day Peru has fallen upon evil times, it was formerly in a very prosperous condition, with a flourishing trade in guano and nitrates. The difficulty was its isolated position. Ships from the Old World had to go round Cape Horn, a dangerous and much-dreaded voyage, and it was with the Old World that the principal trade was done. To avoid this long journey a Philadelphian, Henry Meiggs, started upon a very daring railway project. This was nothing less than to run a railway right over the Andes, and thus connect the seaport of Callao with the River Amazon. The Andes are unique amongst mountains for the depth of their ravines and the precipitous nature of their cliffs. In some places there were dizzy ledges along which the railway line was laid; more often there were none, and Meiggs had to blast away the cliff, or pierce the mountain with a tunnel. It is said that he used a million pounds of explosives every month. The line is only 136 miles long, but it cost the huge sum of eight and a half million pounds.


Photo. Underwood & Underwood

On the Oroya Railway, Peru

This line, the Peruvian Central Railway—more commonly known as the Oroya Railway—has the distinction of being the highest in the world. Apart from the visible obstacles in their way, Meiggs and his men had other foes far more terrible. Of course they suffered from mountain sickness. The summit level of the line is 15,645 feet above the sea, and this was only to be expected. The most terrible feature of the effort was the building of the bridge of Verrugas. This bridge crosses a deep gorge, and large numbers of workmen were engaged upon it, because the building of the line could not proceed until the bridge was ready to carry materials. All at once a fearful sickness attacked the workmen on the bridge, a swift and deadly sickness for which no cure could be found, because no one knew what it was.[1]

Hundreds of men died, and most of those who were fortunate enough to escape fled from the spot. The bridge was at last completed by bands of adventurers, tempted by the enormous wages offered. Many of them perished, but the work was achieved somehow. Meiggs himself was untouched by the fever, but the horror and misery of the pestilence completely broke his spirit. He died soon after, having brought the line as far as Chicla. Nothing more was done for fourteen years, when another Philadelphian, William Thorndike, was engaged to carry on the work. His finest achievement was the driving of the Galera tunnel, nearly 4000 feet in length, through the summit of a mountain. From this point the line was quickly carried down to Oroya, which at present is the terminus.

The Oroya line is not the only one over the Peruvian Andes, for the railway which runs from Mollendo to Lake Titicaca crosses them at an altitude of 14,600 feet. The Arica-La Paz Railway is the latest of the mountain railways

[1] The sickness is now supposed to be due to something in the water of the Verrugas. A recently published guidebook informs its readers that no harm will come to them by passing through the district, but recommends them not to linger in the valley!

of South America. It runs from Arica, on the Pacific coast, to La Paz. La Paz is a very remarkable city. It is the capital of the department of the same name in Bolivia, and is built on a plateau in the Andes which stands nearly 12,000 feet nearer the sky than London. The people who dwell in La Paz enjoy a salubrious air, and are content to lead a simple life in mud houses. It seems odd to me that these people, who live in a city which is under snow for five months of the year and under cloud for the remaining seven, should live in touch with the most wonderful railway that the genius of engineers has yet devised, surpassing all in its magnificence of design and the consummate skill with which the contractors hurled themselves at the forbidding Andes, and conquered them in a short and sharp campaign of three years. They took their rails and carried them over the Andes, choosing for this feat a point where the mountains are only 14,000 feet high. The gradients are so steep that instead of ordinary rails the rack system is employed for more than 25 miles, and the engines crawl up and down tooth by tooth. The bridges, however, constitute the most remarkable feature of the enterprise. As in the case of the Oroya line, immense gorges had to be crossed somehow, and as a rule the only possible method was by single-span bridges. The railway was completed in 1912, and I have no doubt that it is now sending down to the world copper and alpaca wool from the mines and flocks of the good people of La Paz.

The first transcontinental railway in South America was opened in 1910—opened throughout, that is; for in that year was welded the last link in the chain of railway communication between Buenos Ayres in Argentina and Valparaiso in Chile. This last link is a tunnel some two miles long, driven through the Andes at an elevation which is equal to rather more than the tunnel's length, 10,000 feet. It belongs to the Argentine Transandine Railway,

a line 111 miles long, which "connected" Mendoza, on the Argentine Great Western Railway, with Los Andes, on the Chilian Railways, by means of a gap in the lines, over which passengers and baggage were carried in wagons. This form of connection, or rather of disconnection, had its disadvantages. For instance, it was only available for six or seven months in the year, when the roads were not snow-bound; also, it was attended by a certain amount of discomfort, though I have no doubt that the excitement of the journey and the wonders of the scenery compensated for this. It is said that this "combination transport" coach service used to be the most efficient of the kind in the world. *El Servicio Cordillera* comprised twenty coaches, ten baggage wagons, five hundred horses, and a hundred and fifty men, besides a guard of constabulary.

So many big mountains have been conquered by the railway builder that the theme has lost its novelty, and people do not now gasp at it as they did a few years ago. The great mountain lines of which I have spoken so far have been constructed to noble ends: the bringing of distant peoples into touch with the busy world, the opening of new outlets for their industry and enterprise. Can as much be said for the Jungfrau Railway? Is the gratification of a tourist's curiosity to know what it feels like and looks like to be on a mountain top a sufficient excuse for the engineer's endeavour, or is it desecration of his own handiwork and of God's? As a work of engineering the Jungfrau Railway is sublime. As a work of utility it hardly seems worth the money and the time spent on it. It was to have cost £300,000: double that amount and you will be somewhere near its actual cost to-day. When the railway is finished it will be by far the highest in Europe. It will carry you, if you are lucky enough to give it the chance, to the very summit of summits of the Jungfrau itself, 13,669 feet above the sea.

Asked to name from among all the railways of the world

the one which comes first in pure romantic interest, I should hesitate between two—the pioneer of all railways and the Trans-Siberian Railway, the longest in the world. The main line of the Trans-Siberian, from Cheliabinsk to Vladivostock, is 4696 miles, but this is only part of its through all-rail connection. You can get on board a train at Ostend and stay in it until you are turned out at the terminus at Vladivostock—7300 miles from the starting-point. Eleven days on a train! On and on and ever on you go, through Belgium, or, if you prefer, through Holland, and then through Germany, across Russia, and so on through a huge country of which most of us know practically nothing, beyond that it is a land of enigma; a land wherein we meet the strangest contrasts, great wealth and resources and absolute sterility; high civilization hand-in-hand with savagery; mighty cities on the fringe of mighty deserts; warmth to grow pomegranates and melons, and cold to kill every living thing. This railway displays the highest ideal of railway building. It is true that when Russia planned the line she thought little of the benefits its construction would bring to her neighbours in Europe and the Far East, and less, perhaps, of its importance to her Siberian domains. What the Tsar dreamed of when, on 17th March, 1891, he confirmed by his sanction the plans that his ministers laid before him, only the Tsar knew. But the ministers dreamed of a great military road to a great naval station on the Sea of Japan, and of one day adding to their master's dominions a great oriental empire—a dream that was shattered.

Siberia has shown itself to be a country of vast possibilities—a land of promise instead of a land of despair and desolation. The railway has banished its frown, and Siberia is to Russia to-day what Canada, the Cape, or Australia is to Great Britain—a great field of endeavour for the surplus population of the mother country. Siberia is a big country—larger than Europe—say about forty

times the size of Great Britain; but it is only beginning to open its eyes, like a huge territorial infant. It will take it a long time to throw off its swaddling clothes, no doubt; but in the meantime its education has begun.

The man whose rubber stamp imprints *Via Siberia* on a letter achieves a mighty monument to the greatness of man. As he stamps for his wages he knocks a big lump off the distance between Japan and China at one end, and London and her sister capitals at the other end. It takes thirteen days to reach Japan from London, and eleven to reach China, by railway, compared with thirty-seven days via Brindisi and the sea route.

The ministers of state who were responsible for the construction of the Trans-Siberian Railway set to work inspired by a laudable patriotism. The railway was to be all-Russian, built of Russian material with Russian labour and under the supervision of Russian engineers. Unfortunately, railways require something besides patriotism in their building, and this something—the highest engineering skill obtainable, backed by unimpeachable financial resources—the Russians had not. The result was that they made a lamentable " mess " of things. But, after all, the errors that were made have since been rectified, so we need say no more about them. Indeed, for sheer luxury of travel, I very much doubt whether any railway in the world has attained such a pitch of perfection as that offered by the Trans-Siberian Railway to its international travellers. Since 1907 the International Sleeping Car Company's trains *de luxe* have been run direct to Vladivostock from Moscow. The trains are composed of first- and second-class sleeping cars, restaurant and baggage cars. The attendants generally speak French, German, English, and Russian. Religious ministrations are not neglected, a clergyman being provided for Sunday services. The speed is comfortably easy, and the line is guarded throughout by soldiers. The first-class fare from Moscow to

Vladivostock, including sleeping berth, costs about £35, 10s., which does not seem very much when the luxurious accommodation is considered.

" Overland to India " is a headline which we have seen in many newspapers during the last few years. That it will be possible to get to India by land—some day—is, of course, likely enough. However, the possibility is hardly likely to be realized yet awhile. The Trans-Persian Railway, which would connect the railway systems of India and Russia, is now being considered.

To most of us, probably, it is not the railway but the railway engine that appeals most strongly. Our grandfathers thought it diabolical; we regard it as sublime: and we are quite right to do so, for the locomotive of to-day is an amazingly efficient machine—that is, efficient as a locomotive; as an economical form of steam-engine it still leaves a good deal to be desired. When you realize how surely and regularly train services are worked on any important railway, you can appreciate something of the reliability of the locomotive.

Many times has the steam locomotive been threatened with extinction by rivals driven by petrol or electricity. It will not be conquered easily; and the hands that work the regulators of to-day will probably be stiffened in death before the great machines they control cease to thunder their way wherever there is land to bear them.

Electric traction will come eventually, but the steam locomotive has a long life before it still. Electricians have yet to find more economical ways of generating and transmitting electricity before that mighty force will oust the steam-engine from the field of long-distance haulage.

Who can tell what the future may not bring forth?

CHAPTER X

His Majesty's Mails

Our story of the wonders of transport would be obviously incomplete if it failed to tell of those wonders which we associate with the postman's knock.

The Incas of Peru, at a period so long ago that we hardly know when it was, traversed their country with wonderful roads, and on these roads stationed swift messengers who could cover a distance of three hundred miles in a night. These men were probably the world's first postmen. We have derived the word "post" from the Latin *positum*, fixed, which at first seems rather contradictory, for we have a way of saying "post-haste" when we mean as quickly as possible. The posts, however, originally were the stations on the road where the runners waited, or where relays of horses were kept. In ancient times, of course, only messages and dispatches of great importance were sent by the post, private letters being entrusted to some traveller who might be going in the right direction. The ancient Greeks and Romans had admirable systems of couriers; in fact the establishment of some definite line of communication has been an essential part of every civilization. Uncivilized peoples have other modes of sending messages of importance. Many savage tribes telegraph to one another by means of their war-drums. Beacon fires have been used as long as fire has been known, but they have very great disadvantages and are not reliable means of communication.

Marco Polo gives us the following details of communication, in the country which we now call the Chinese Empire, in the thirteenth century:

"From the city of Kanbalu there are many roads leading to the different provinces, and upon each of these, that is to say, upon every great high road, at the distance of twenty-five or thirty miles, accordingly as the towns happen to be situated, there are stations, with houses of accommodation for travellers, called yamb or post-houses. These are large and handsome buildings, having several well-furnished apartments, hung with silk, and provided with everything suitable to persons of rank. . . .

"In the intermediate space between the post-houses, there are small villages settled at a distance of every three miles, which may contain, one with another, about forty cottages. In these are stationed the foot messengers likewise employed in the service of his majesty. They wear girdles round their waists, to which several small bells are attached, in order that their coming may be perceived at a distance; and as they run only three miles, that, is from one of these foot stations to another next adjoining, the noise serves to give notice of their approach, and preparation is accordingly made by a fresh courier to proceed with the packet instantly upon the arrival of the former. Thus it is so expeditiously conveyed from station to station, that in the course of two days and two nights his majesty receives distant intelligence that in the ordinary mode could not be obtained in less than ten days. . . . At each of these three-mile stations there is a clerk, whose business it is to note the day and hour at which the one courier arrives and the other departs; which is likewise done at all the post-houses. Besides this, officers are directed to pay monthly visits to every station in order to examine into the management of them, and to punish those couriers who have neglected to use proper diligence. . . .

"When it is necessary that the messengers should proceed

with extraordinary dispatch, . . . they ride two hundred, or sometimes two hundred and fifty miles in the course of a day. On such occasions they carry with them the tablet of the gerfalcon as a signal of the urgency of their business and the necessity for dispatch. And when there are two messengers, they take their departure together from the same place, mounted upon good fleet horses, and they gird their bodies tight, bind a cloth round their heads, and push their horses to the greatest speed. They continue thus till they come to the next post-house, at twenty-five miles distant, where they find other horses, fresh and in a state for work; they spring upon them without taking any repose, and changing in the same manner at every stage, until the day closes, they perform a journey of two hundred and fifty miles. In cases of great emergency they continue their course during the night, and if there should be no moon, they are accompanied to the next station by persons on foot, who run before them with lights; when of course they do not make the same expedition as in the day-time, the light-bearers not being able to exceed a certain pace. Messengers qualified to undergo this extraordinary fatigue are held in high estimation."

The first letter post was established in the Hanse towns in the thirteenth century, and was greatly improved and developed by the Emperor Maximilian. In our own country a postal system was always instituted in times of war, for the carrying of dispatches to and from the front. In the time of Elizabeth there were four postal routes, to Scotland via Berwick, to Beaumaris for Ireland, to Dover for the Continent, and to the Royal Dockyard at Plymouth; but these posts were simply for the use of the Court, and only postmasters were allowed to keep horses for posting or to collect and deliver letters. People who could send or receive letters were considered quite capable of conspiring against their queen and country, and were suspected accordingly. Indeed, so nervous were those in authority that

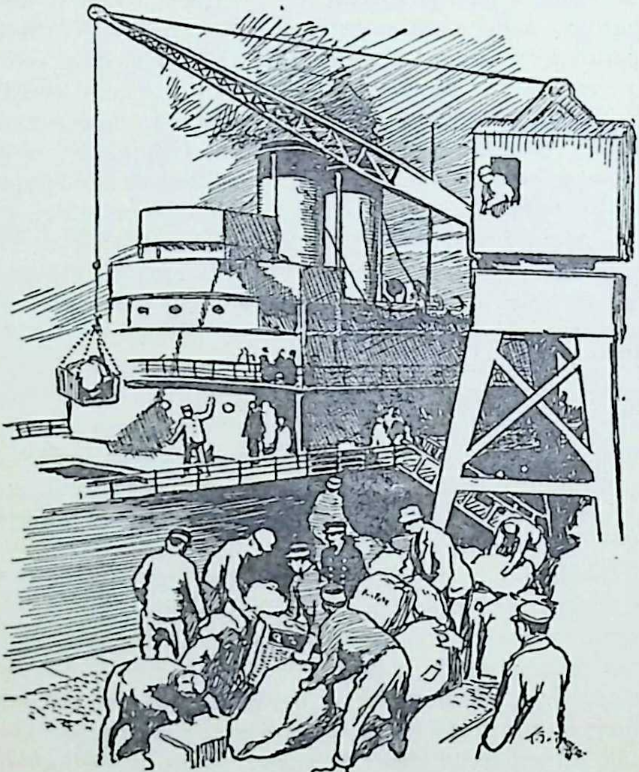
to carry a letter was made a criminal offence, and anyone detected in the act was thrown into prison.

We owe a great deal to a man of whom few of us have ever heard. In the seventeenth century, when it took a month to send a letter to Scotland, Thomas Witherings organized a system by which private letters could be sent at private cost. He also persuaded the postmen to "hustle", to such good purpose that they managed to perform the journey to Edinburgh in six days. Mail-coaches first appeared towards the end of the eighteenth century, and were immediately successful, in spite of the vigorous opposition of the Post Office; to be followed in 1830 by the first mail-train. All this time the charges for sending letters were terribly high. One sheet weighing a quarter of an ounce could be sent for eightpence. When Sir Rowland Hill introduced his Penny Post Scheme, the idea was received with indignation and ridicule, was voted absurd and impossible; but Sir Rowland had his way and the thing was given a trial. Of course its success was immediate. A community that had somehow managed to send letters at a cost of several shillings did not hesitate to make use of a service that only cost a penny.

The British Post Office is the largest and most complete institution in the world. It makes regular use of every known means of transport, and we may be sure that in times of emergency it improvises any means it can to fit the occasion. A great deal of the work of sorting the letters is done on the postal trains that are racing across the country in all directions at dead of night. These travelling post offices are marvels of skilful contrivance. Apart from the mechanism for picking up and setting down the mail-bags while the train is travelling at full speed, the vehicles are artfully arranged sorting offices in which a vast amount of work is done under conditions as comfortable as it is possible to make them.

There are many places in the British Isles where a post-

man does not call every day. The Shetland Islands receive letters four or five times a week, the Scilly Islands only twice a week in winter and three times a week in summer.



Shipping Mails at Dover

St. Kilda is sometimes isolated by rough seas for weeks at a time, and no ship can call to deliver anything. Then the letters are put in a cask, to which a flag is attached, and the islanders wait for a favourable opportunity to send a boat out to pick it up. Tristan da Cunha is perhaps the

loneliest spot in the world. Its little mail-bag sometimes lies at the General Post Office for as long as two years before a ship leaves England that intends to call.

In other parts of the world we find the postman equipped to face climatic conditions. In some parts of South Africa he runs *au naturel*, except for an elegant girdle of feathers, carrying the letters in a forked stick. In the East he is generally provided with an umbrella. If he has to wade through a river in the course of his journey the mail-bag goes on his head, well out of the reach of the water. Or he may be in the region of ice and snow, and go upon skis or skates. He has any number of willing four-legged helpers, too. When we send a letter to Klondyke, for instance, we know that it will probably finish its journey on a sledge drawn by dogs; or in Lapland, one drawn by a reindeer. In the deserts of Africa a camel will carry it, a llama in the wild and rocky districts of South America, while we secure the services of the elephant in India.

Now the motor mail service is firmly established, and there is no possibility of any looking back.

From the latest available return of the Postmaster-General we learn that the use of motor-vans for the conveyance of mails is still being extended, and it is satisfactory to note that the Postmaster-General adds the comment that the extension is being made " with advantage ".

There are appointed stations out in the country where motor mails from various big centres meet in the dead of night to exchange bags. The exchange effected, the vans return to their starting-places, or proceed on their journeys. Such a meeting takes place shortly after each midnight at the crossroads at Stony Stratford, in Buckinghamshire. The vans come from London, from Birmingham, and from Leicester, and so accurately are they timed that they usually reach the meeting-place within a few minutes of each other. On their coming, the local postmaster, or his deputy, appears upon the scene and takes charge of the proceedings.

The doors of the vans are removed, bags are taken out, checked, sorted, and exchanged; the vans are reloaded, and after a pause of less than thirty minutes the London and Birmingham motors continue their journeys, and the Leicester van darts off on the road to its starting-point. The whole process is carried out in the open street by the light of the post-office lamps.

No branch of the nation's transport service can claim a more important place than can the carrying of the postal parcels. In this branch the motor is surely and steadily coming into its own. There are indications that before very long the greater proportion of the road mail services will be conducted by means of mechanically-propelled vehicles, and the mail horse will almost as completely disappear as our old friend the bus horse has from the London streets. This is as it should be, for the motor will bring about—is, in fact, already accomplishing—a speeding up of a service already remarkable for its promptitude. The postal service is growing year by year, and already the number of inland postages handled in one year amounts to more than five thousand millions. It will readily be seen, therefore, that if the Post Office is to continue to cope with this ever-growing mass of material, it must take all the help the modern motor-van can give. Speed! That is the word which embodies the spirit of the times, and greater speed still will be given to our written communications through His Majesty's motor mails.

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